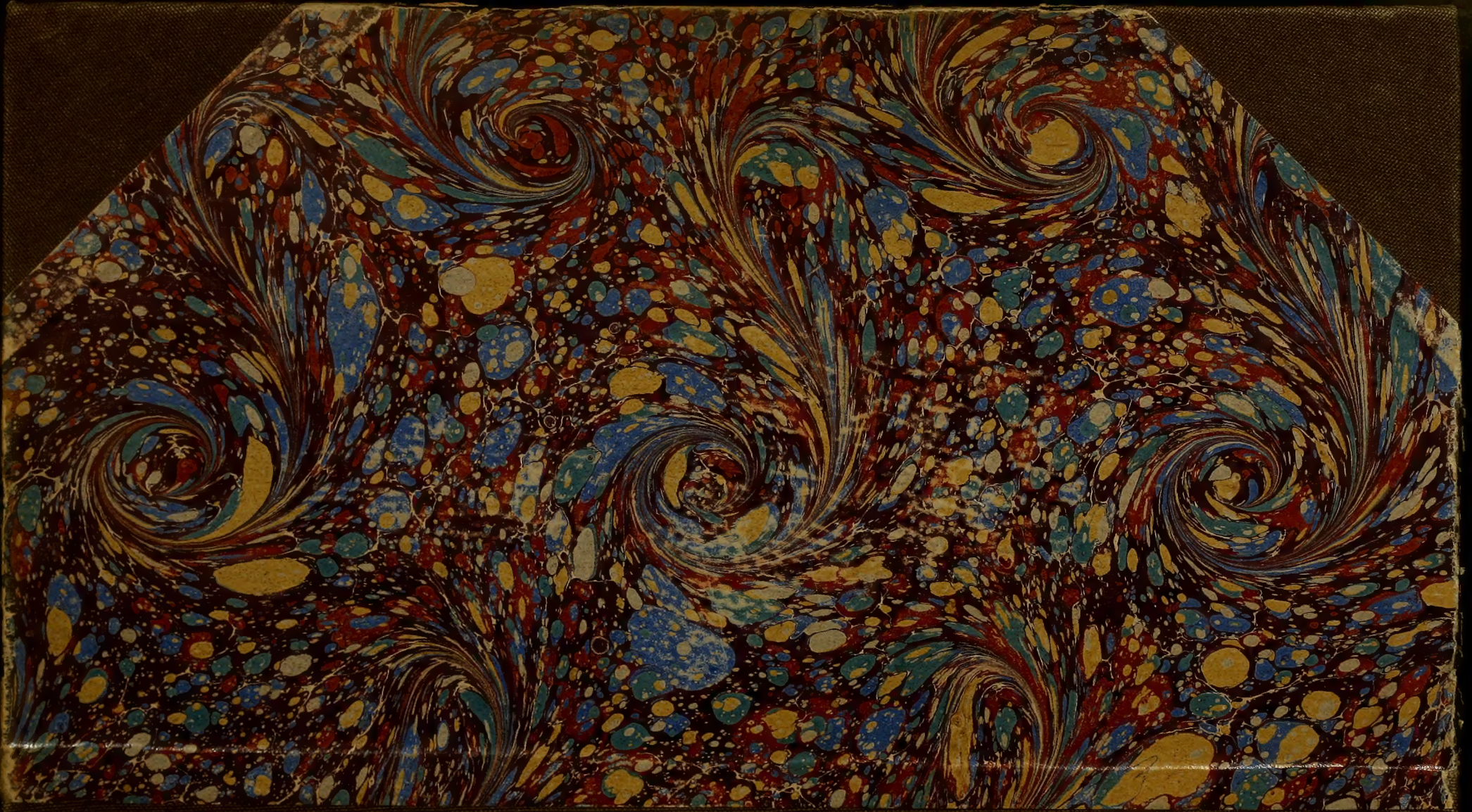


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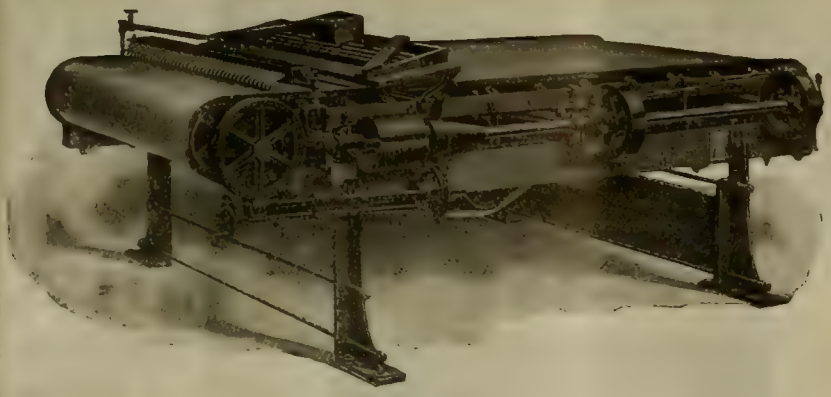
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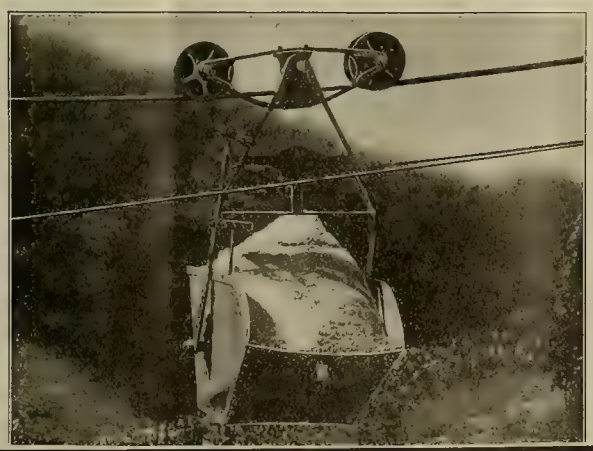
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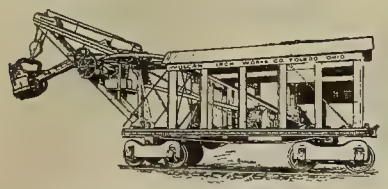
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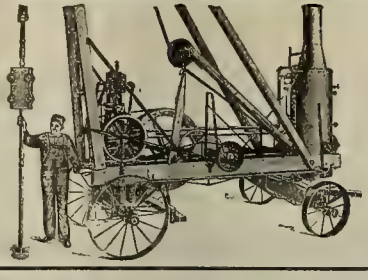
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Editorial.

ON THE BASIS of the rate of production for the first half of the year, the output of pig iron in the United States for 1906 should be 25,000,000 tons. This compares with 22,992,380 tons in 1905 and 16,497,033 tons in 1904. The market for pig iron continues to be steady and so long as this barometer of industrial activity marks fair weather, we may expect a continuance of national prosperity.

MINING MEN are always glad to hear of rich ore being found at great depth. The New Chum Railway mine at Bendigo, in Australia, is driving a new level at 4,262 feet vertically below the surface. In the neighboring Victoria Quartz mine the shaft is being completed between 4,154 feet and 4,254 feet. This news ought to cheer the prospector in Nevada who has just struck it rich at grass-roots.

OUR ESTEEMED CONTEMPORARY, *The Mining Record*, of British Columbia, makes a complaint that the Canadian Mining Institute neglects the interests of Western Canada, and more particularly British Columbia, which produces one-third of the mineral output of the Dominion. We, who also dwell on the Pacific, might similarly complain of the American Institute of Mining Engineers, when so large a part of its transactions are devoted to iron and coal, but we do *not* complain because, as our contemporary states, the American Institute does give the Western men generous representation in the Council and encourages the submission of papers dealing with subjects of interest to them. It might be well for the Canadian Mining Institute to adopt a similar policy.

THE COST OF PRODUCING COPPER is often under-stated, through omission to include the expenses of shipping, refining, and selling. In estimating profits, the cost per pound of converter bars at some railroad points in the West is quoted against the market price of the fine metal, as a measure of the success anticipated for a new enterprise. The cost of refining copper on large contracts is $15 per ton and, allowing for the usual deductions, it averages $18 to $20 per ton in most cases; this is equal to nine-tenths of a cent per pound. If to this are added the freight to New York, the charges of the selling agents and other small deductions, the total expenditure in marketing converter bars reaches 1½ to 1¾ cents per pound. Those about to start new enterprises are apt to quote the costs prevailing among large mines with an established production, overlooking the fact that the treatment charges are always less to mine owners who are able to assure a steady output. To companies in the youthful stage, the cost of marketing unrefined copper is fully two cents per pound.

Our Motto.

A good wine needs no bush and a suitable motto should require no explanation. Nevertheless, it seems fitting at this time to give reasons for the faith that is in us. "Science has no enemy save the ignorant." It is a true saying and worthy of all acceptation. Time was when the mariner cut down the oak and made him a vessel wherewith to cruise the seven seas; he depended upon the fickle wind to propel his ship and he steered by the light of the stars. As he fared forth across the main and began to make traffic over the waste of waters, he found the need of something stronger than the old wooden boat, something more certain than the stars. His brothers took the iron from the earth and gave him steel to sheathe his ship, they dug the coal from which he drew the throbbing energy that furrowed the wave, they made him a compass whose trusty finger should point a path when the storm curtained every star. Navigation became a science and naval construction an art. So also to those who go down to the mine in skips; to them Science gave tools, energy and a light wherewith to illuminate the dark places in the earth. The simple digging of ore was well enough so long as the miner did not penetrate far from the daylight, using pick and spade to move the mineral, applying his muscle to carrying the product of his toil and the sight of the ore as the guide to his advancement. But as he burrowed farther, these simple ways did not suffice, he harnessed the horse to his windlass and made a whim, he yoked the oxen to the cart that carried his ore, he compelled the torrent to turn a wheel and drain his hole in the ground. Then, penetrating to a depth greater than the height of the tallest trees, he found simple mechanical methods began to fail, he called on Science for help, for further he could not go alone. Aid was given abundantly. Steam replaced muscle, steel replaced wood, and engineering took the place of rule of thumb. Far from the day-light he penetrated into the adamantine heart of the earth, until he walked in galleries a mile beneath his dwelling.

But even that was only a beginning. Science sharpened his tools with the diamond and quickened his operations with electricity. And then with faithful hand and trusty word, she told the miner how to separate the waste rock from the valuable mineral, the dross from the metal. Metallurgy became an art. Nor was this the end, Science did more; in every department of his manifold operations she breathed a system which crystallized into a great industry, orderly as the arrangement of a crystal, smooth as the working of a machine. The prospector became a geologist, the miner became an engineer, the hole in the ground became the basis of a business that supported a vast community. And yet the story is not told, for Science became more than an aid to work, she became a companion in pleasure, a guide, a philosopher, and friend. As the piece of ore is converted to burnished silver, so the old common sense was transmuted to a trained intelligence ready to cope with every problem in life. Man went forth to conquer, first nature and then himself. Self-reverence, self-knowledge and self-control led him to sovereign power. Therefore, as a child to its mother, as a patriot to his native land, so he who mines the ore, who wins the gold, refines the silver or smelts the lead, turns to the fairy who has blessed his going forth and his coming home; he honors her ways, which are ways of truth, he follows her light, which suffers no eclipse; and to those that follow he says, "With this sign shalt thou conquer: 'Science has no enemy save the ignorant.'"

Postal Facilities.

A deputation waited on the Postmaster General of Great Britain, during the current week, to urge the Government to open negotiations for penny postage with the United States. By an arrangement already made and to go into effect on January 1, 1907, the international postal rate is to be five cents, not per half-ounce, as at present, but on the full ounce. This tendency to decrease the cost of postal rates is important; it facilitates business and promotes civilization, for it is obvious that the more frequent communication between people living in different countries tends to soften asperities and to promote good understanding, as nothing else can do. From a business standpoint, the lessening of the rate on an ounce letter will bring relief, especially to our English friends, who complain, not without reason, of the large number of American letters on which they have to pay because of insufficient stamps. As the half-ounce regulation allows only of one sheet of such business letter-paper as is used in America and as it is not the custom to provide special paper on thin envelopes for foreign correspondence, as they do in England, the limit of weight is often exceeded. In any event, the cost of 10 cents for a letter of ordinary length is a heavy tax. The removal of it will be acceptable. Penny postage with the British Empire would be a great boon, but it seems a good deal to expect. Certainly, it would be a decided help to an enlargement of business between the Anglo-Celtic peoples. We shall have it some day, inevitably, and we can afford to appreciate the initiative of the English in this regard, for from the days of Rowland Hill, to whom the British domestic penny postage is due, they have led the world in improving and cheapening the facilities for correspondence.

In this connection, it may be stated that our London letter takes 12 to 13 days to reach us, our Johannesburg correspondent's letter arrives here regularly in 30 days, and recently a letter even from Bulawayo, in Rhodesia, reached us in 31 days. From Melbourne and Sydney we hear within three weeks. We can communicate with New York in four days and with Denver in two. With Alaska and Mexico communication is less regular, but Dawson can be reached in eight, and Mexico City within five days. Thus are the ties of interest and the bonds of business drawn together. Ten years ago a mining paper at San Francisco was handicapped by the time consumed in the transmission of news from the more distant mining centres of the world. Today it is not. Fast trains and steamers, together with the telegraphic wires that link us to far-away mining communities, enable us to hear promptly what others are doing, while living in the midst of a community that does something itself in mining and metallurgy.

By the Way.

In a lecture delivered at Columbia University and published in *The School of Mines Quarterly*, Professor Wilhelm Ostwald, of Leipzig, explained certain fundamental ideas in a luminous manner. He said:

The general chemical facts, which we call oxidation and reduction in our times, were recognized and brought into scientific comprehension during the eighteenth century. It was known, for example, that just the same substance which is formed by the burning of charcoal in the air could be formed by mixing the charcoal with certain substances, litharge, for example, and heating the mixture; the litharge would be reduced to metallic lead and the charcoal would disappear, just as it disappeared in burning in air. On the other hand, metallic lead would be changed into litharge by heating it in contact with air. In a similar way different substances could be burned and then brought back to their former condition by heating them with a more combustible substance. In such a way the general idea of reduction and oxidation was formed long before oxygen as a substance by itself was known. To get a comprehensive view of all these facts the theory of phlogiston was invented. According to this the change of properties and the evolution of light and heat during combustion were all connected with the existence of a certain element called phlogiston. If a substance burned, a flame generally appeared, and it was assumed that phlogiston passed away from the substance during combustion. Then it was assumed that in the process of reduction the former properties were restored to this substance by uniting it with phlogiston. This gave quite a comprehensive theory of combustion, as you are aware, with one false assumption.

Instead of assuming that the product of combustion is the result, as we now know, of an addition of oxygen to some element, it was assumed that something, namely, phlogiston, had disappeared. It was quite natural to assume this, because by observing the combustion of such substances as wood, coal, charcoal, etc., the disappearing of something was obvious. We now know that the disappearing substance changed into invisible gases, but in those days it was natural to assume that combustion was not connected with the addition of something, but with the disappearance of something, and this something they called phlogiston. We must therefore look upon the phlogiston theory not as sheer nonsense, but as the result of an entirely logical generalization, combined only with one mistake, which was discovered later by actual measurements. But exact measurements are dependent upon the progress of science. Everything begins with rough observation; after the fact is known in a rough way closer investigation begins.

Now, the oxygen theory as developed by Lavoisier accepted a very large part of the old phlogiston theory, namely, a general idea of combustion and reduction; it only explained that combustion means the union with oxygen; and reduction, the separation from oxygen.

The oxygen theory of combustion proved more satisfactory than the old phlogiston theory, because oxygen was a substance known, investigated, and measured; in short, was recognized as a chemical element, a kind of matter, while phlogiston existed only in a theoretical way as a property like the Aristotelian elements. It was impossible to get phlogiston in a bottle and employ it for scientific investigation, while it was possible to do this with oxygen.

This great change was brought about, as I have mentioned already, by the discovery of another law, which was known in its rudiments long before, but which was expressed clearly by Lavoisier, that is, the law of the conservation of weight. This law means that if we take a certain amount of matter (we use this term still, because everyone thinks he knows what matter is), and enclose it in some way so that nothing can be lost, we do not know of any change which may occur in this mass of matter which would cause a change in its total weight. Even if there is a chemical change occurring, this matter will not alter its weight, although some substances may disappear during this process and others may be formed. It is not self-evident to assume, for instance, that by changing solid sulphur and gaseous oxygen into gaseous sulphur dioxide no change in the total weight will occur. There was no necessary connection known between weight and chemical change; for just as the other properties of matter are changed by chemical combination, the weight also might change. Indeed, there was every possibility that a change in weight might occur. It was so little impossible that a most distinguished chemist, Professor Landolt, of Berlin, sacrificed fifteen years of his scientific life to investigate this very question, that is, whether there is any change of weight connected with chemical weight, with the result that he could discover in most cases a slight diminution in weight. He is not quite sure if the diminution is really connected with the chemical process, but he has observed it. This is just the point of this most difficult and refined investigation, to tell if the diminution is real and connected with every chemical change, or dependent upon some incidental circumstances. So you see that the conservation of weight is by no means a self-evident proposition. Self-evident things are things which we do not take care to investigate closely, and it was simply a scientific question whether in chemical combinations there is a large change in weight, a small change, or no change at all.

Therefore it was an important discovery to show that in a great number of cases no appreciable change in weight occurs. And Lavoisier by using the balance secured a very simple means for defining an element. If we start with a certain amount of a certain substance, and bring about a chemical change of any kind, and then ascertain in what wise the weight has changed, we shall observe one of three possible cases: either the weight has diminished, the weight has increased, or the weight has remained unchanged. If the weight has diminished, the fact can be explained on the basis of the law of conservation of weight, only by the assumption that something has gone away, for example, a gas, and that therefore our substance was a compound one. To give an instance: If we heat mercury oxide, and change it into mercury, and find there is a certain loss of weight connected with this change, we must conclude that some substance has gone away from the mercury oxide, and therefore the mercury oxide is certainly a compound of mercury. Mercury itself may be an element, but this is not yet proved. We will first have to investigate all the possible changes of mercury, and if we find that all possible changes of the mercury are connected with an increase of weight, then we may define mercury as an element.

On the basis of the law of the conservation of weight, we can therefore define an element, and this has practically been done since Lavoisier. An element is any substance which can be changed into another substance only by increasing in weight, inversely, a compound is every substance which can be changed into another substance with a decrease in weight, depending of course on the additional fact that some other substance has been formed at the same time. This is a definition of an element which you will find in those text-books which are more carefully written than the ordinary text-books are. In ordinary text-books I do not think you will find any experimental definition of an element, for the writers assume in a general way that everybody knows what an element is, or define it by the help of the hypothetical atoms.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

IN cutting rubber for gaskets, etc., have a dish of water handy and keep wetting the blade of the knife. It makes the work much easier.

TO FIND OUT whether a plate is burned or crystallized, cut a thin chip for the distance of an inch or so with a thin sharp chisel. If the chip curls up the iron is good.

WHEN driving out bolts, where you have no protection for the thread, strike the hardest blow you can give with a heavy hammer. Light blows with a small hammer will upset or rivet the bolt-ends.

TO PREVENT lamp chimneys from easily breaking, put them in a pot of cold water over the fire, and add some common table salt. Boil well and let cool slowly, then take out the chimneys and wash them well.

TO CLEAN varnished paint-work make up a solution by boiling spent tea-leaves in water, and apply this hot with a soft piece of flannel, always rubbing one way. Rub dry with a soft cloth or with clean white waste.

TO CLEAN smoky chimneys, dilute a teaspoonful of sulphuric acid (oil of vitriol) with five or six times its bulk of water. Dip into the solution a piece of flannel tied to a stick and draw the flannel through the chimney, then rinse in water and wipe dry.

THE centre of percussion in a moving body is that point which would strike an opposing body with greater force than any other point. If the opposing body is immovable, it will receive all the force of a rigid moving body which strikes with its centre of percussion.

TO DRILL holes in glass, use a common steel drill, well made and well tempered. The steel should be forged at a low temperature, so as to be sure not to burn it, and then tempered in a bath of salt water (brine solution) which has been well boiled. Such a drill will go through glass rapidly if kept well moistened with turpentine in which camphor has been dissolved.

TO KEEP machinery from rusting, take one ounce of camphor, dissolve in one pound of melted lard, take off the scum which forms, and mix in as much powdered plumbago or black-lead as will give it an iron color. Clean the machinery and smear it with this mixture. After 24 hours rub clean with a soft linen cloth. It will keep clean for months under ordinary circumstances.

TO CUT a glass tube, for example, a glass gauge-tube, saw it two or three times lightly with a wetted three-cornered saw-file and it will mark or nick the glass. Now take the tube in both hands, both thumbs being on the opposite side from the mark and about an inch apart, then try to bend the glass, using the thumbs as fulcrums, and it will break at the mark where it has weakened the tube.

WHEN mixing various metals, melt the one having the highest melting point first, and then add the others in the order of their melting points, heating them first to prevent their chilling the metal already melted, and stir them with a wooden rod. Should the metals tend to volatilize, or to form an oxide, keep the surface covered with a layer of fine charcoal. Be sure to skim the surface of the metal carefully before pouring.

EFFECTS of freezing on quick-setting portland cement mortar: Numerous experiments have shown that such mortar is not injured, provided it is not frozen, until 12 hours after it is placed, and that it is kept frozen until set. If a one-half per cent salt solution is used for mixing the mortar no injury results from freezing. Hot water hastens the setting of portland cement mortar, at the same time retarding the freezing.

CHILLING, chill-hardening or chill-casting gives great hardness to the outside of cast-iron, by pouring it into a mould made of iron instead of sand. The iron causes the outside, or skin of the casting, to cool very rapidly, and this, for some unknown reason, increases its hardness. The process is frequently confounded with case-hardening, which consists in converting the outer surface into steel, by heating it while in contact with charcoal or potassium cyanide.

TO REPAIR a water pipe, mix a moderately stiff putty from red and white-lead in boiled linseed oil, and work into it some hemp chopped into short lengths. Lay it over the crack in a moderately thick mass. Wrap it tightly around the pipe with some strips of canvas, in so doing overlapping both ends of the crack; and finish by serving, or closely winding it, with marline (small hemp cord of two strands loosely twisted). If the pipe is found to be worn thin, or is full of holes, bend a piece of thin sheet-copper or tin to the round of the pipe over the putty, then put on canvas, and serve or wrap with marline as before directed.

A REVERBERATORY FURNACE is a structure of refractory materials, so designed that it can be economically heated to a sufficiently high temperature throughout a hearth of large dimensions. In general four conditions must be satisfied: High temperature, economy of fuel and labor, suitable dimensions, and design suited to its particular use. In addition, such a furnace may be required to give alternately a high or a low temperature, as in a re-heating furnace or in a lead-smelting reverberatory: again it may have to give simultaneously different temperatures at different parts of the hearth, as in a glass-furnace or a roasting-furnace: or, once more, different temperatures in different compartments, as in the Hofmann furnace for bricks and pottery ware.

THE management of a concentrating mill or stamp mill: The secret of success in running a concentration mill lies much in procuring a well-trained and competent man to take charge of it, for the business requires as much education and skill as needed in the reduction of ores. E. H. Davies, in his recent work on 'Machinery for Metalliferous Mines,' says: "I have known a case in which a first-class modern concentrating plant, for treating lead and blende ores, was entrusted to a man whose only knowledge of engineering was in connection with steamers and marine engines. Needless to say, failure resulted, and the tailing was as rich as the crude ore. In another case, I knew of a first mate of a steamer being put in charge of a gold mine and mill, with a result which may be anticipated. It is just as necessary to put fully qualified medical men in charge of a hospital; though the grave error of putting amateurs, or relatives of directors of a mining company, to look after the most costly and intricate machinery is continually being made."

DISTINCTION between 'dead' and 'live' load: Dead load is that which is applied gradually, as the weight of the structure itself. A live load is one applied suddenly, or accompanied by vibrations, as that of a train traversing a bridge, or the force exerted in a moving machine. The effect of a live load is twice as severe as that of a dead one of the same weight. Hence, a structure, designed to support a live load, should have a factor of safety twice as large as the one used for a dead load. The load of a crowd of people walking on a floor may be considered to be a mean between that of a dead and a live load. In laws relating to the loads on floors, the weight, outside of structure and fixtures, is referred to as live load, no matter of what it consists, but, in that case, it has not the significance given by engineers, as above defined. The building code of Greater New York specifies the following as the maximum permissible loads for different soils: Soft clay, one ton per sq. ft. Ordinary clay and sand together in layers, wet and springy, two tons per sq. ft. Loam, clay or fine sand, firm and dry, three tons per sq. ft. Very firm coarse sand, stiff gravel, or hard clay, four tons per square foot.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Large vs. Small Machine-Drills.

The Editor:

Sir—There has been much discussion of late relative to the comparative cost of the various methods of mining. This is a subject of much interest and importance in view of the fact that the adoption of some certain method which may be particularly applicable to peculiar conditions may represent the difference between operating at a profit and losing money. Even when no actual loss occurs and where a profit may be had, it is still the aim of the management to make that profit as large as possible. This is accomplished by close attention to details, and the adoption of those methods of working best suited to actual conditions. It is an unwise policy to work along a certain line simply because it has been satisfactory at some other mine, for a system that may be eminently successful at the Big Bonanza mine in Colorado might entail certain disaster if installed at the Tight Scratching property in the next State or even in an adjoining township. This argument will, I think, hold good in a general way whether we are considering a reduction-plant or a power-drill.

There are men today who contend that for fast work and general satisfaction—not to say a minimum cost—the larger type of drilling machine is to be preferred to the one of smaller calibre. Personally I find that this is only true to a rather limited extent. While I can only speak in this regard in a general way, having no available data of my own, I would draw the attention of the reader to the paper of F. T. Williams, dealing with this subject and published in Bulletin No. 8 of the American Institute of Mining Engineers. This paper gives us the result of an exhaustive comparative test between a large and a small machine.

The chief item wherein a saving was made by the 2½-in. drill over the 3½-in. machine was in operating expenses, which were 50% less or one-half; and the total cost of the cross-cut in which the small machine was used was just 27% of that driven by the bigger one. In this test it appears that the conditions were identical. The ground was Pikes Peak granite, coarsely porphyritic; this doubtless was good drilling ground. Then a highly indurated andesite, or phonolitic breccia was tried; this rock was unquestionably hard and very likely was inclined to drill uneven on account of its brecciated nature. Then with true massive andesite, trachytic phonolite and other rocks of a similar character, rock was encountered that called for steady pounding on the part of the drill. The comparison showed that the small machine accomplished about 88% of the work done by the larger at a cost of 27% less. This work was done on the sill-floor. If a test were to be made in all-round mining, I believe it would show results even more favorable to the small machine.

There is no doubt but what there are certain conditions under which it would be desirable to use only the larger size, as in shafts or a drift where it would require the whole shift in order to rig up, drill the round, and blast. It will be found, however, that in ground of average hardness, permitting of a reasonably straight hole, it will be a great advantage to use a machine that one man can operate. If everything is as it should be, the face clear of broken rock and the machine and accessories in good order, the machine man can go on shift, drill his round, and blast on quitting. In the case of the larger drill, under similar conditions, the men will drill the round and if they get through early they cannot blast as a rule until quitting time, or if they do the smoke will prevent them from doing anything more at that point. Of course, if there are two or more places to use the drill, it will be otherwise, but that is not often the case. Therefore, in the case of the one man and small machine, he gets in his round of holes and blasts; in the other case, the two men do practically the same thing and no more. The first cost, labor expense and air-consumption are decidedly in favor of the smaller machine.

It will be claimed that the larger machine will drill a longer hole and, as it calls for larger steel, the hole will be of greater diameter, thus permitting of more powder at the bottom. As to the length of hole, it will be found that the smaller drill will handle a hole deep enough for practical purposes in a drift. It is a poor machine that will not put in a hole five feet if the drill is kept clear in the hole; many of the crooked holes are merely the result from inattention on the part of the operator. A little good judgment at the right moment will, in almost every case, prevent 'fitchering' in machine drilling as well as drilling by hand. Many a hole has been bottomed after it has shown a disposition to 'fitcher' by swinging the machine and running on as short a stroke as possible. The intelligent miner is ever quick to avail himself of every little knack that he finds is of benefit to him.

Some men think a large machine will force the bit through a slip which would put a small machine out of business. Let us observe two hand-drillers at work. The drill starts sliding to one side of the hole. One of them, a big, husky fellow with a No. 6 hat and No. 11 shoes keeps on pounding the drill with trip-hammer blows and trying to twist the drill, which by this time is 'stuck.' He then curses the drill, throws down the hammer and may-be his hat and gives utterance to language which, if printed, would be unmailable. One sensible man on the other hole, when he finds the bit commencing to slide, holds it toward the slip and, when he feels it to be in the right position, taps the head of the drill a few light blows and, as a rule, manages to square the end of the hole and keep right on drilling. These same arguments are applicable to machine-drilling.

There is more logic than poetry in the adage of the Cousin Jack that "They that can't schemey must lousster." Now, as to the other contention in favor of the larger machine, that it drills a larger hole, thereby allowing a greater amount of powder to be placed near the bottom, etc. That the nearer the powder is to the bottom of the hole the more effective it becomes, no miner will deny, but it is questionable if this advantage, gained in this way is sufficient to pay for the greater cost of the larger hole. I never hear this argument advanced but I think of an incident that occurred at one time in British Columbia. A certain corporation was driving a tunnel to serve as an aqueduct. The rock was a hard quartzite and, beside being hard to drill, it would not break well. During one of the visits of the consulting engineer the nature of the ground was brought to his attention and the fact of its being hard to drill and mean to break. When asked for a suggestion in that regard he gave it as his opinion that the proper thing to do was to make the drill-bits bigger so that a larger hole would be made and the charge placed nearer the bottom of the hole. When this idea was communicated to the man in charge of the work he laconically observed that it might be still better to make one good big bit the size of the tunnel and bore it all out and thus save the cost of the powder.

There is a point at which the economical limit is reached in the size of the drill-bit. When this point is passed it would doubtless be better, if the explosive does not act to advantage, to chamber the holes with a light charge

first, then blow or scrape out the loose dirt and place the full charge. This is, of course, objectionable on account of the gas created, but this is not great and can be reduced by blowing for a few minutes.

It is frequently the case that the 'cut' holes are not given the inclination necessary for good work; sometimes an extra hole, judiciously placed, will make a great difference in the breaking of the round. Whenever circumstances will admit, the 'cut' holes should be fired alone; if they fail to explode or do not bring the ground, the other holes will not have been fired in vain.

The question of drilling and breaking ground is only one of the things which have to be considered in the operation of a mine and which tend to increase or decrease mining costs, depending on whether or not the best system applicable to the conditions is employed to the best advantage. It would be rank foolishness to use a power-drill in certain kinds of ground, while in ground that is hard to drill and does not break well, so as to require a whole shift to drill the number of holes necessary, it may be advisable to use a two-man machine. For average ground, however, it will, I think, be found far more economical to use the one-man type. The miner will have to be entirely self-reliant, and, being left to his own devices, he will exercise his best judgment.

In development work, if speed alone is to be considered, there is no question but what the large-size drill should be used, but it may prove a short-sighted policy to sacrifice else everything for the sake of a few feet of additional opening per month. Many of our large shafts bear witness to this. They have been sunk with the largest drills, the holes filled with explosive and when the explosions have taken place the result has been very much as though a small earthquake had occurred. The orders have been: "Fill her with holes, give them plenty of powder and don't be afraid of making lots of room." One immediate result is the removal of a large amount of rock unnecessarily, sometimes accompanied by a set or two of timbers. Then after a while the timbers, owing to the shattered condition of the surrounding rock, commence get out of alignment and it requires constant attention to keep the shaft in shape. Frequent shut-downs are the direct result of speedy sinking, and the cost of maintenance, together with the loss of time required for repairs would seem to indicate that the "get there quick" policy may after all have some very serious draw-backs.

Butte, June 7, 1906. EDWARD W. RALPH.

ALUMINUM PATENTS.—On April 2, 1906, the patent of Charles M. Hall on a process for making aluminum expired. This patent was granted to Mr. Hall on April 2, 1899. It protected the use of an electrolyte composed of cryolite as a solvent for bauxite, and one of its special features of value is that it possesses the important property of being easily fusible. Charles M. Hall is connected with the Pittsburg Reduction Co. of Niagara Falls, and the patent has given the Pittsburg Reduction Co. a practical monopoly of the manufacture of aluminum in the country. While the Hall patent has expired, it is stated at Niagara Falls that the method of operation of the Pittsburg Reduction Co. is still protected by the patent granted to Mr. Bradley, one of the early pioneer workers in the aluminum field, and which does not expire until February 2, 1909.



Central Park and Albesu Theatre, Havana.

WHERE a water-blast is used in mine ventilation its efficiency is nearly proportional to the height and volume of the column of falling water. A fall of 30 ft. gives a fair amount of air, but the same amount of water falling 100 ft. affords a much larger volume of air and it will issue from the air-water column with greatly increased velocity, enabling the air current to travel along a greater distance in the mine or to ventilate a greater part of the workings.

Three Weeks in Mexico.---I.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The tide was sweeping down the channel as the *Seguranca* left her berth at the Brooklyn wharf and swung into the East river. It was a clear sunny morning early in October and the great harbor of New York looked its very best. To the sound of many whistles our steamship threaded her way among the ferry-boats and barges that congregate where, off Governor's Island, the estuary separating Long Island from Manhattan meets the waters of the Hudson. As we passed between Fort William and the Statue of Liberty the broken sky-line of New York City stood silhouetted against the sky. There was just enough smoke to soften the outlines of the serrated pile of lofty buildings that, like a Titan's stronghold, guard the great waterway. Knowing the manifold activities that have created the island city, I felt the impressiveness, rather than the poetry, of the scene. Even such smoke as came from the tall towers of steel and stone, called, with grim humor, the 'sky-scrapers,' seemed, not the incense rising from a peaceful cottage, but the murk of battle, the confused black fog of complex strife. Despite her higher mental activities and benevolent endeavors, New York, rising proudly by the waters that made her a great seaport, is the expression in stone of a relentless materialism, a predatory finance and a reckless luxury of life. Even the statue of Liberty, with her bronze oxidized to green and her guano-crowned head, has the air more of an old woman holding aloft a hot penny to incite a scramble among the awaiting larrikin, than of the representative of a freedom long since changed to license. As the *Seguranca* turned into mid-channel we could see the dark canyon of Broadway and the series of splendid structures that line its sunless depth. Trinity Church is no longer to be seen, it is obscured by a 23-story sky-scraper where congregate daily a group of men capable of running a continent—and they do their best. The financiers look down upon, and over, the spire of Trinity—in more senses than one. When Huxley came to America, in 1876, he, like all visitors, was impressed with the scene presented even by the undeveloped New York of that day, and seeing the yellow dome of the *World* building, which for so long dominated the high roofs of the city, he exclaimed that in approaching the shores of other lands, the first thing to be seen was a church-steeple, but that here, emblematic of the unshackled thought of a new country, the first to catch the eye was the tower of a newspaper. If he had only known for what literary sewage that yellow dome stood sentry, he, though an agnostic, would have longed to see the old-fashioned landmark. Trinity steeple is dwarfed by the Empire building, but, thank the Lord, the dome of the *World* building is hidden by several recent monuments to the growth of our steel industry. Yet, as the city is left in our wake, growing dim amid its thin veil of smoke, the brutality of the crowds at Brooklyn bridge, the foul air of the Subway, the merciless sandbagging of Wall street, and the putrid politics of Tammany, are forgotten in the beauty of the harbor and the splendor of its life. Approaching The Narrows, between Staten Island and Long Island, the white hulls of the battleships at anchor off St. George, the swift passage of a handsome yacht, the slow procession of barges crossing to Brooklyn, the stately sailing ships preparing for a long voyage, and the majestic movement of a huge Atlantic liner coming to port, all emphasize the multiplicity of a throbbing life, the pulsations of which are felt the world over. And so, farewell, thou Empress City of the New World, thou hast the respect that comes to those that have power and the admiration that is due those that are magnificent, but if thou dost not win the love that comes from kindly deeds and homely service, thou reckest not. Men may come and men may go, so long as steel is strong and gold is good!



New York City, from the Harbor.

It was four days to Havana. The port is guarded by the Morro, a castellated fort standing on a promontory to the left of the entrance. During the late Spanish-American war, Morro castle was often busy, but it did no execution until the very last day; in fact, after the armistice had been signed at Porto Rico. On that solitary occasion a shell went through the *New Orleans*, a cruiser, from stern to bow, between decks, killing no one, but playing sad havoc with the officers' quarters. Within

the harbor, one is still reminded of the late unpleasantness by the remains of the sunken battleship *Maine*. The military mast and a portion of the 'strong-backs,' or iron superstructure, project above the water. To them I saw attached a metallic wreath on which was inscribed "Memori Missouri," evidently placed there by the men of another battleship. The *Maine* was blown up on February 16, 1898, and I recollect the stir it made in distant lands, for on that day I happened to be at Cairo, in Egypt, where everyone in the Anglo-American colony confidently accepted the tragedy as the forerunner of war. There have been many discussions as to the responsibility for the crime, but it is generally accepted among the well-informed that it rests upon the *partido revolucionario*, the revolutionary party in Cuba, whose object it was to embroil the United States in war with the Spanish Government. How well they succeeded, all the world knows.

I shall not try to give any account of Cuba, even at second hand, for is it not told, and told well, by Robert T. Hill, whose 'Cuba and Porto Rico' is a monument to his insight and industry. Cuba is a lovely island, about the size of New York State, with every acre covered by good soil and possessing a variety of economic resources. Only 10% of the island is cultivated; in the valleys of the western hill-country is grown the tobacco which has done so much to soothe mankind, to express the courtesy of the civilized and to promote the friendship of the thoughtful. Naturally, I went to a cigar factory and bought some real Havana cigars on the spot, fresh from the making. In a large room about a hundred men sat in rows before small tables, like school-boys' desks. They were wrapping the tobacco leaf into cigar form. As they worked, a man standing on a stool read to them from the daily paper; he read dramatically and well, the purpose being to keep the workers interested. The proprietors of such establishments encourage this practice, which is general, because the men do not talk while the reading proceeds. When a Spaniard talks he uses his hands in gesture, hence he cannot employ them in labor; therefore the reading encourages efficiency. The men pay 10 cents per week from their wages ($3 per day) to the reader, who, in large establishments, makes as much as $125 per month.

Most travelers have spoken of the unhealthiness of Havana, of the dirt and filth that force their contrast with its beauty and color. Whatever criticism may be passed, by an unfriendly historian, on the American interference with Cuban affairs, it is certain that the sanitary measures undertaken after the war have wrought wonderful improvement. Garcia, Palma, even Sampson and Schley, were great men, but greater than these were George Waring and Leonard Wood, who did more for civilization than the leaders of war. And theirs was a contest with dangers as great as come to those on the battlefield, for Waring died, the victim of the yellow fever which he almost eradicated.

But Havana interested me most as a link in the story of Spanish conquest. Hernando Cortez, after outfitting at Santiago, called at the port of Havana before starting upon his great quest, on February 10, 1519. His fleet consisted of eleven vessels, more than half of them open brigantines, and the biggest not to be rated at over 100 tons. Thence he went to the coast of Yucatan, making a halt at the island of Cozumel, before proceeding to the mainland of Mexico, and landing at Vera Cruz on April 21. We followed nearly in this course, for from Havana we went to Progreso, the port of Merida, which is the chief city of Yucatan, and from there we also went to Vera Cruz, on our way—as did Cortez—to Mexico City. The parallel served to emphasize the difference. Cortez and his buccaneers went through uncharted seas and to a land they knew only by rumor; to them the West was full of an unlocked mystery and the place of untold gold; to us there was keen interest and expectation also, but it was an interest toned by experience and an expectation limited by knowledge. However, even the *conquistadores* can have had no more discomfort or have used language more picturesque than the passengers of the *Seguranca* when we lay off Progreso for three days at the mercy of a 'norther,' or north wind, which prevented the captain from unloading his cargo or coming to anchor. Progreso is an open roadstead, and when the north wind blows, the lighters that transship the cargo of the larger steamers are afraid to leave the shelter of the wharf; hence wearisome delays such as ours. And when the sea calmed it was painful to watch the unintelligent manner in which unloading proceeded. Among other consignments there was one of 40,000 bricks; the passengers, eager to see the steamer on her way, watching the wretched *peons* removing this cargo from the hold, suffered with an impatience only to be surpassed by the mortification of the consignee who must have paid heavily for his bricks only to receive them in a badly battered condition. Don't ship bricks from New York to Yucatan!

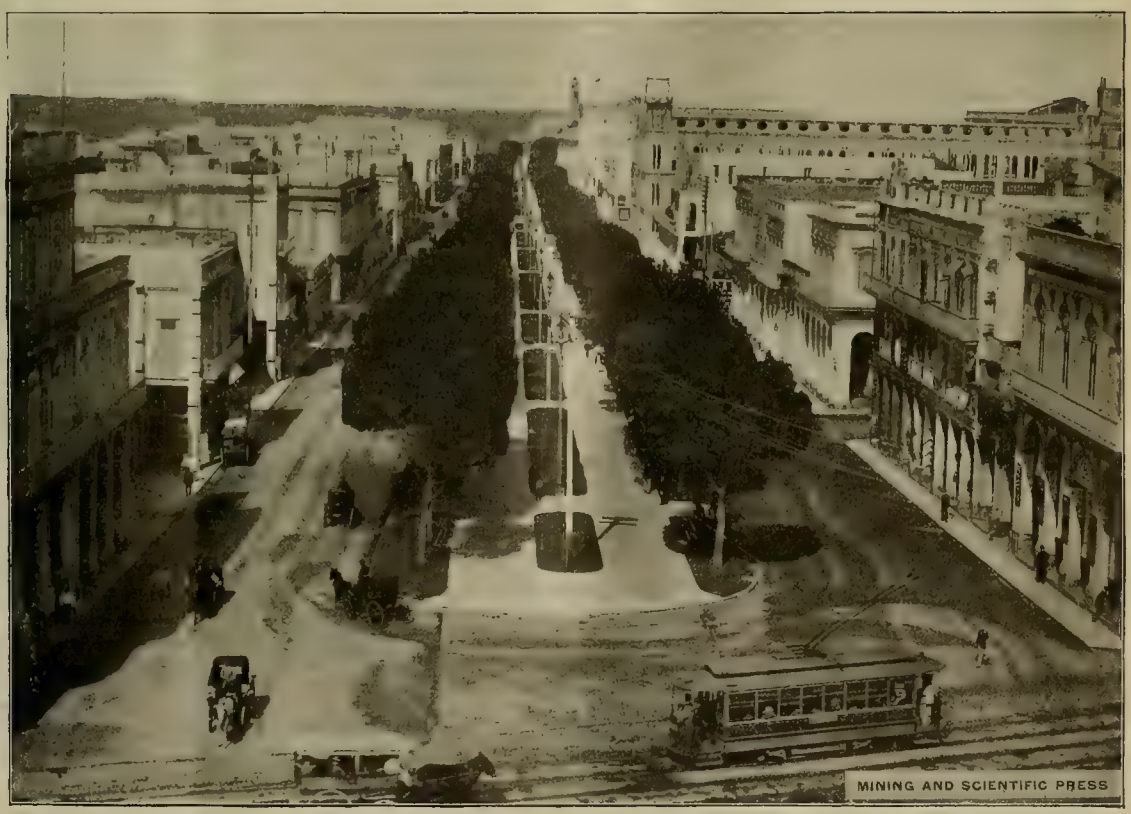
Between New York and Vera Cruz we saw no mines; nevertheless, it will be interesting to refer to certain facts of history. The first of the islands (afterward called the West Indies) to be colonized was Hispaniola, subsequently known as Hayti and Santo Domingo. The great admiral, Columbus, had discovered it in 1492 and it was he that named it 'Little Spain.' At Isabella and Santo Domingo were founded the first settlements made by Europeans in the New World. Hispaniola was rich in gold, for the early records make frequent mention of the mines; these were the Buena Ventura placers and other diggings in the Cibao region where the forced labor of the natives was employed, often in a cruel manner, to wash the gravel. Spanish estimates of the production—according to my friend, F. Lynwood Garrison—range from $200,000 to a million dollars per annum during the first quarter of the sixteenth century. The chief mining towns were Cotui and La Vega; as far as can be judged, the gold came chiefly from the erosion of small stringers in the diorite of the Cibao range.

It was the impoverishment of these mines that led to the colonization of Cuba. This island had been named Juana, and then Fernandina, but the Indian name has survived all the Spanish christenings. Cortez was a member of the expedition sent by Velasquez, the governor of Hispaniola, to conquer Cuba, in 1511. Subsequently, but before he invaded Mexico, he was one of those that secured an estate there, living on his plantation and introducing some of the first of the cattle that were brought to Cuba. It is interesting to note that Cortez settled at St. Jago, a name since corrupted to Santiago. He is said to have worked for gold within his domain, the deposits promising better than those of Hispaniola. But Cuba never produced much gold; it is true that the first Spaniards found the natives in possession of personal ornaments made of gold, but these represented the metal gathered in small quantity and during a long period. The extermination of the aborigines prevented their tyrants from learning anything about the source of the gold. Since that day Cuba has won a position as a mineral region, but this is due to her deposits of iron and manganese, together with those of copper, which occur within a few miles of Santiago, where Cortez was *alcalde*. Across the bay, in the mountains of Cobre, are the ancient mines whence the great *conquistador* derived both his gold and copper. Their development has been revived since the Spanish-American war and it is to be hoped that they will become the basis of steady industry.

At last, three days overdue, we arrived within sight of



A Glimpse of Old Havana.



The Prado, Havana.

the Mexican mainland. It was a sunny morning, with a breeze raising white caps on the sea and moving masses of cloud from off the dark bank on the western horizon that marked the land of the Aztecs. Clouds obscured the view, mountains loomed to the northward, and among them the gleam of snow; straight ahead the sun shone on the white buildings of Vera Cruz, making a brilliant fringe along the shore. But there was no sight of Orizaba, the volcanic mountain, 17,356 ft. high, that rises from the flats behind Vera Cruz and forms a great landmark in this part of Mexico. Borrowing a telescope, I could distinguish, over the dancing blue waves, the yellow strand of St. Juan de Ulua and behind it the towers, graceful as campaniles, of the town of Vera Cruz. The white wings of fishing boats came into the picture, and northward forest-clad mountains rose massively, some of their summits crested with snow. But there was no peak of Orizaba. Almost by accident, I shifted the telescope to a higher angle and then, suddenly, in startling beauty, above the clouds, almost in mid-sky, there stood the vision of a glorious pyramidal mountain, the sun shining on the snowfields and defining the ravines, a vivid picture, strangely silent, rising above darkly wooded slopes that in their turn rose from white cumuli, below which level lines of heavy cloud served to accentuate the loftiness of the peak and also to divide the vision piercing the upper sky from the panorama of sea and shore. It was a delicious moment; no one on the ship had caught sight of the mountain; the unexpectedness of the apparition and the vividness of it intensified the deep delight produced by one of the most glorious pictures that ever awakened an artist or inspired a poet. It seemed so high above all meaner things, rising sheer from the sea, the intervening flat layers of mist accentuating the height, while the brilliant sunlight upon the snowfields made it appear closer than the lowlands at the base. In a way, it reminded me of my first view of the Southern Alps of New Zealand, as seen one morning on board ship coming from Tasmania, when the serrated peaks flanked by pine forests rose above the troublous dark green waves that came in the wake of a storm. But in that picture there was a series of high crests; here, there was one in solitary grandeur and without a peer. Scenes such as these compensate for the discomforts of travel and afford a stock of impressions from which one can draw on dark days and in restful hours when the memory harks back to the past, as to the refrain of some sweet song.

THE USE OF MATHEMATICS IN ENGINEERING.—To all but a very small group of men, mathematical formulæ remain, not only a foreign, but a repellant language, to be used for giving perfect precision and definition to ideas expressed in the vernacular. Again, these formulæ may be employed in extremity, and where verbal expression fails, much as when, in despair, we turn to Latin and Greek to drive a thought home deeper and surer than we can in English, where that latter language is either defective, or where we are clumsy in its use. And finally, we utilize them much on the same principle that we turn to medicine, when diet and the observance of the rules of health fail. Experienced teachers recognize the fact, that to the minds of nearly all men, ideas are brought more easily by means of their own native and every-day language, and by pictures or by diagrams; and, that if they are to teach successfully, they must teach, not only with all their energy, but with all their skill along the line of least resistance to the introduction of new thought; in order that, with the time and strength allotted them, they may work the greatest aid to their fellows.—HENRY M. HOWE.

The Down-Town District of Leadville.

The Down-town district includes the streets and buildings of the city. Its surface is covered by 200 to 500 ft. of glacial material, forming a gently sloping tableland which extends to the Arkansas valley, and must be passed through by mine shafts before they can reach the underlying rock in place. Very large bodies of ore, mainly in oxidized form, have been and are still being discovered in the underlying rocks, and it is to aid in their development that a special map is being prepared.

In the early surveys of the district, made in 1880-81, Mr. S. F. Emmons distinguished two divisions in the gravelly material that covers the rock in place; the lower, which is stratified and consists mainly of fine-grained sands and marls, was called 'lake beds,' while the upper division, which consists entirely of unstratified boulders and clay, was called 'wash.' The former beds were assumed to have been deposited in a glacial lake ponded back in the upper Arkansas valley by the glaciers which issued from the lake fork of the Sawatch mountains, near Twin Lakes, during the first glacial period. In the terms of modern physiography, these deposits would be for the most part more properly classed as glacial-fluvial beds, as has been claimed for the whole by glacialists who have recently been studying the Twin Lakes region; but Mr. Emmons still inclines to the belief that a lake covered a part, at least, of the upper Arkansas valley in which the finer materials, issuing from beneath the earlier glaciers, were deposited. The faulting of these beds, shown in the recent mine workings, proves a certain amount of uplift in the region back of Leadville since the glacial period.

In the original survey it was shown that the slopes of the Mosquito range, back of Leadville, consist of fault-blocks successively uplifted toward the east along north and south striking faults, in which the sedimentary beds lie in shallow synclines, the faults themselves following the steeper limb of the anticline. Recent underground developments have shown that, while the main fault-planes were correctly located, their displacement was often distributed on several planes, so that the beds to the west of each fault zone descended not with the even slope of a syncline, but in a series of steps. Depths below the surface of the basins, as determined on the syncline theory, were in general correctly given in the successive cross-sections of the original map. In the case of the block represented by the Down-town area, however, no shafts had penetrated the covering of glacial deposits, and, while a shallow syncline in the underlying limestones was assumed to exist in this block as in the others, no facts were available from which the western limit of the synclinal basin could be determined. The finding of ore in this area was primarily dependent upon whether the ore-bearing limestones had been eroded off before the so-called lake beds were deposited; in other words, whether the slope of the rock-surface beneath these beds is greater than the dip of the limestones.

Mine workings opened in this area during the last ten or fifteen years have disclosed a number of more or less parallel faults by whose displacement the beds have been carried down as though by steeper dips than those observed, thus increasing the horizontal area of possible ore-bodies. The vertical range of the beds has also been shown to be much greater than was originally supposed, the ore making at several different horizons, called 'contacts,' by the miners. While the possible extent of ore-bodies still existing in this western basin is thus shown to be much larger than was originally supposed, no sufficient data from shafts or borings are yet available to accurately determine its western limit.

Ely, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR H. HALLORAN.

Ely, or rather the Robinson mining district, occupies the course of a transverse gash in the Egan range in the east-central part of White Pine county, Nevada. This range is one of a large number of north-south folds rising from the desert floor of this, the Basin Region, the characteristics of which have been so well described in the writings of the earlier members of the Geological Survey. It lies 30 miles west of the Utah-Nevada line and is parallel to it for nearly 150 miles. Ely is 85 miles east of Eureka and 139 miles south of Cobre on the Southern Pacific railroad and it is this comparative inaccessibility that has prevented rapid growth. But now the Nevada Central had laid 50 miles of the standard-gauge track from Cobre (135 miles west of Ogden) and is expected to reach Ely by the end of July. This railroad follows the easy grade of the west ridge of the Steptoe valley, forming an entrance much more convenient than the present tortuous travel over five mountain ranges and across four desert valleys.

Leaving the main line of the Southern Pacific at Palisade in April of this year, I rode 80 miles south to Eureka on the Eureka and Palisade narrow gauge, taking five hours to make the trip. One should buy a ticket from Palisade to Ely for $15 rather than pay $8, the railroad fare from Palisade to Eureka, and the $10 stage-fare from there to Ely. This stage runs six times a week, at this time of the year, usually requiring 24 hours of continuous riding night and day to make the trip. There has been such a congestion of traffic that travelers often have to wait their turn for two or three days at Eureka. This route in its course across the grain of the country, rises to an elevation of nearly 8,000 ft. Ely and Eureka are both at an altitude of 6,350 feet.

The Ely of to-day is yet in the making, the rawest of Nevada mining camps, just awakened to its enormous possibilities after a lethargy of thirty years. Already one thousand men are crowded into its insufficient accommodations and thousands more are but waiting convenient access and more definite data before making a rush. The past winter and spring have been the severest in years, and in consequence the roads have been bad and the hauling of supplies has often been delayed until the town was on the verge of famine. There is now abundant food, such as it is, but very little accommodation. A few fortunate ones have beds in frame houses. Many are glad of the privilege of paying 50 cents per night for a cot in a tent, and often the saloon tables and chairs are utilized as makeshift couches. All timber for building and for mining has to be brought from a distance, as nothing but mountain mahogany, juniper, and scrub-pine grow in even the most favored parts of this desolate region. An unfortunate combination of muddy roads, poor and insufficient horses and great demand caused a mighty gathering of supplies at Eureka that taxed the freighting facilities to their utmost. One team took three weeks to make the round trip. Many men have waited over a month for such baggage as exceeded the limit of 30 pounds.

The object of this 'rush' is the enormous bodies of low-grade copper ore. It is yet too early to predict their extent, but enough work has been done to show that Ely is destined to be the center of a great copper-producing region. Extravagant reports of the immensity of the deposits have been issued, based upon certain unproved assumptions. These reports have often overreached themselves in endeavoring to attract an influx of capital. There is little to suggest that these low-grade ores can ever seriously threaten Butte's supremacy as a copper district.

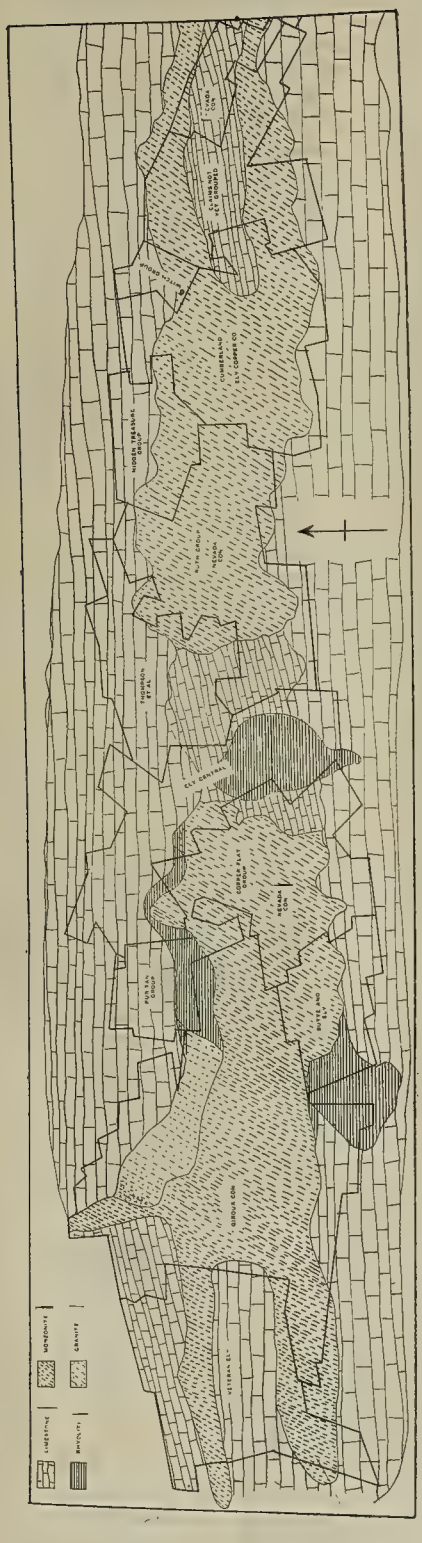
While this district has been visited by many of the best known mining engineers, their reports have been made to private companies and but little has been published concerning the orebodies and their occurrence. That of J. Parke Channing, made in August, 1905, was the conservative basis for a development which has since opened up enormous bodies of copper. The ore is found in a porphyry dike, intrusive in limestone and shale. The dike has been tracked for seven miles in an east and west course. As shown by surface croppings, its width will vary from 1,500 to 4,000 ft. with an average of 2,500 ft. On the surface it is weathered brown, with but little trace of copper, but after sinking from 50 to 100 ft., pyrite and chalcocite are found in small seams and disseminated masses throughout the whole rock.

This igneous rock, or porphyry, has been determined as rhyolite, intrusive in Carboniferous limestone. It carries disseminated irregular grains of metallic sulphides, the latter apparently taking the place of the black bi-silicates. The mineralized areas seem more silicious than the unaltered rock. As before stated, a leached cap covers the workable ore. At a depth of from 300 to 400 ft. the ore becomes leaner, until it is too low-grade for profitable working. This suggests that subsequent to the primary mineralization of this dike its upper portions were leached and the copper re-precipitated by reaction with pyrite as first shown by the experiments made by H. V. Winchell on the Butte ore. This theory is borne out by the finding of pyrite coated with chalcocite and covellite.

This limits the depth of the ore to 350 ft. at the most, with an average less than this. It has been stated that ore has been found wherever a shaft was sunk in the porphyry, and on such foundation it has been reasoned that the whole body is mineral-bearing. That such reasoning is fallacious is shown by the occurrence of barren zones of monzonite and by the intersection of unexpected limestone bodies in depth. In a number of places the ore has been opened up for a length of 900 ft. and a width of 500 ft. Exploratory work in the two properties of the Nevada Consolidated Copper Co. is said to disclose 22,000,000 tons of ore. Channing estimated it at 12,000,000 tons, but a great amount of work has been done since then. This great mass of ore averages 2.5% copper, 40 cents in gold and a trace of silver. It is easily broken, as most of it will crumble in the hand, and it can be readily concentrated in the ratio of 9 to 1 by simple crushing, jigs and tables.

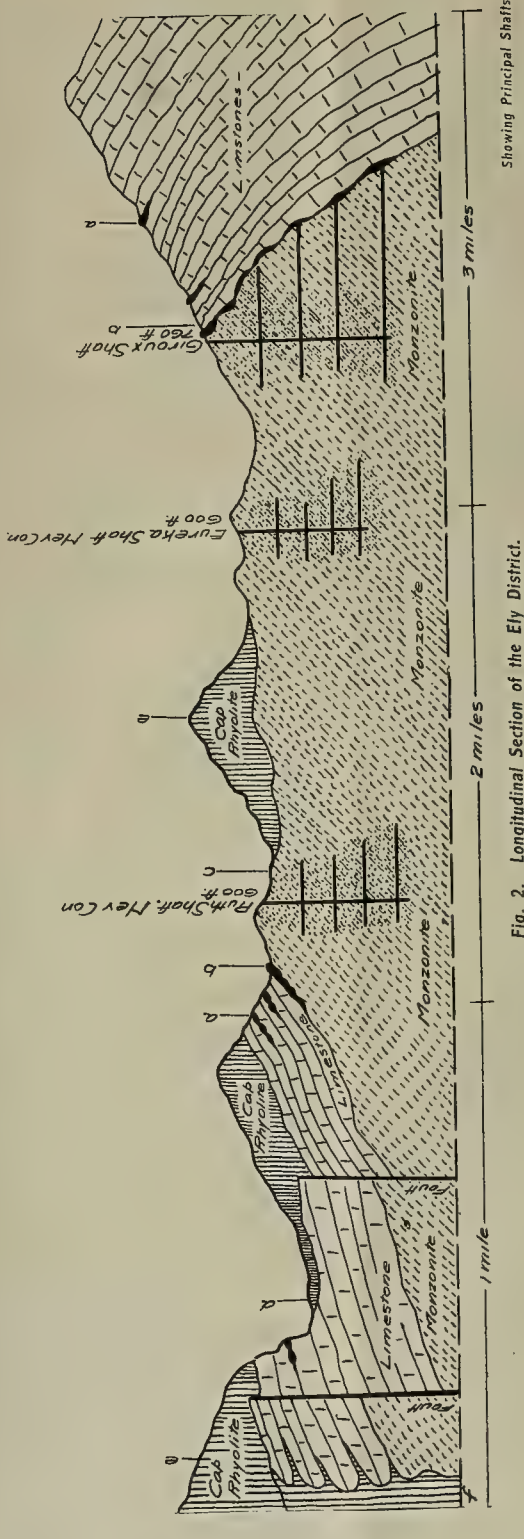
The whole lode, together with the limestone on either side, has been staked out by prospectors. Many of these claims have been gathered together to form the large acreage owned by the companies now operating. On this cropping there seems to be no claim which has not been consolidated or is in process of consolidation with others. The accompanying map (Fig. 1) shows the approximate holdings and positions of the various companies together with a rough outline of the surface geology. I could not determine whether the area marked rhyolite and tuff was wholly extrusive.

The western limits of the porphyry are being worked by the Veteran Ely Copper Co., which has opened up a large tonnage by means of a long cross-cut tunnel. George Gunn is manager and D. Shovlin, superintendent. Adjoining on the east, the Giroux Consolidated Copper Co. has done considerable work, particularly on the contact of the limestone and monzonite. Six shafts have been sunk to a depth of from 200 to 800 ft. and good ore opened in both the porphyry and limestone. A site for the concentrator has been graded and a blast-furnace



Showing Boundaries of Mining Properties.

Fig. 1. Geological Map of Ely, Nevada.


Limestones
Monzonite
Cap Rhyolite
Limestone
Limestone
Monzonite
Limestone
Monzonite
Limestone
Monzonite
Cap Rhyolite
Cap Rhyolite
Cap Rhyolite
Limestone
Monzonite
Limestone
Monzonite
Limestone
Monzon

installed. The property was first worked to develop the high-grade contact deposits, but it promises also to produce large quantities of low-grade ore. The mine workings are centered around Kimberley, eight miles west of Ely.

The next holdings to the east are those of the Nevada Consolidated Copper Co., at present the best developed property in the district. It includes the combined claims of the old New York and Nevada Copper Co. and of the White Pine Copper Co. The Chainman millsite near Ely has also been absorbed. At Copper Flat this company has two shafts, the Eureka No. 1 and Eureka No. 2, each down over 400 ft. From these, drifts and cross-cuts have defined up large bodies of low-grade copper ore which are to be stripped and extracted with steam-shovels. The ore is friable and readily handled by this method. A mile and a half to the east, the Ruth shaft has been sunk to a depth of 650 ft. on an incline of 41°. Drifts have been run at the 200, 300 and 500-ft. levels, showing an orebody 900 ft. long and 300 ft. wide with three faces still in ore. Cross-cuts driven every 200 ft. prove the continuity. This immense body of ore is to be worked by the caving system through a new four-compartment vertical shaft now being sunk at the Star Pointer. A 60-ft. steel head-frame and an electric hoist will replace the present equipment.

An experimental mill on the Ruth indicated that a saving of 78% could be made in a water concentration of this ore. Ground is now being broken for a 1,000-ton concentrator two miles below Ely to treat the combined output of these two mines. Plans have been made for a 2,500-ton copper smelter below the concentrator and an initial unit of three 85-ft. reverberatory furnaces, with the necessary converters, are to be put in at once. An abundant water-supply has been provided.

To the south of the Nevada Consolidated and Giroux, the Butte & Ely Copper Co. has sunk a shaft 100 ft. through the leached cap into the sulphide zone. Fine specimens of chalcocite and covellite, precipitated on pyrite, are found in this mine. H. S. Wales is superintendent. Between the Copper Flat and Ruth holdings of the Nevada Consolidated, the Ely Central Copper Co. have ground that is to be tested with drills. The porphyry here is covered with what is apparently a rhyolite capping, the thickness of which must be ascertained before much development work can be done. On the east the Ruth group is bordered by the Cumberland-Ely and by the Witch group. The former is being opened up by shaft and tunnel, and the latter by a tunnel. A number of ungrouped claims to the east are soon to be united into a company.

At the present incomplete stage of development work it is impossible to more than outline the holdings and indicate the possibilities. Undoubtedly a large number of 'wild cats' will be organized to work copper near Ely, but there is every reason to believe that the companies mentioned mean business. It is possible, but not probable, that the whole of the great dike is mineralized; an assumption that it is all metalliferous has formed the ground-plan upon which has been erected an alluring superstructure promising to tower far above the substantial edifice of assured production. The real object of this has been to boom lots in the town-site of Ely. Its success is shown by the fact that a corner 49 by 100 ft. was recently sold for $15,000. Real-estate speculators are naturally anxious that people should crowd into the district. Conservatively, it is estimated that by the end of this year 3,000 people can be profitably employed in the mines, smelters and dependent industries. But a low-grade camp is no place for a poor man. Abundant capital is necessary to open up and equip the mines. Wage-earners, except those employed in smelter construction, should not go there until after the railroad is completed. It remains to add that 'porphyry copper' is not the only asset of this recently forgotten district. Rich lead, silver, and occasional gold veins are found throughout the tributary country. Cheap transport will solve the problem of their treatment, and it is to their development that the late-comer is now turning his attention. Companies will also be formed to prospect for contact copper deposits and possible lenses in the adjacent limestone.

PRODUCTION OF RARE EARTHS.—A number of minerals that were formerly supposed to be of extremely rare occurrence have lately been found in quantity. The discovery of these deposits is an example of the truth that the supply responds to the demand. It is the advance made during the last five years in the manufacture of various forms of apparatus for lighting purposes that has developed a use for metals and metallic oxides such as tantalum, cadmium, zirconia, thoria, yttria, and cerium, lanthanum, and didymium oxides. With the exception of cadmium, all these materials are now used commercially in the manufacture of different lamps, and are obtained from the following minerals: Monazite, zircon, gadolinite, columbite and tantalite. Monazite is the mineral which contains the oxides used in the manufacture of mantles for the Welsbach and other incandescent gaslights. Although monazite has been found sparingly at many localities throughout the United States, the Carolinas are still the only States that are producing this mineral commercially. An interesting mineral, thorianite, was discovered early in 1905 near Balangoda, Ceylon, associated with corundum, zircon, tin, topaz, spinel, etc. According to the reports on this mineral, it is one that could be more easily utilized as a source of thoria than monazite, and as it has a much higher percentage of this compound, it would be much more valuable. It is not improbable that this new mineral may be found in certain localities of the United States where tin, topaz, zircon and monazite are found. The tantalum minerals are in demand because they contain the metal tantalum. This is employed at the present time in the manufacture of very fine wire for use in the construction of a special lamp. An interesting occurrence of a tantalum mineral has recently been discovered in a feldspar quarry at Henrytown, in Maryland. Near Glastonbury, Connecticut, an old feldspar quarry is being investigated as to the quantity of columbite or other tantalum mineral that may be found in this feldspar. A mineral from Tinton, South Dakota, gives on analysis 44% of tantalic oxide and 30.5% niobic oxide. The production of monazite, zircon and columbite during 1905 amounted to 1,352,418 lb., valued at $163,908, as compared with 745,999 lb., valued at $85,038 in 1904, an increase of 606,419 lb. in quantity and of $78,870 in value. From one-sixth to one-fourth of the monazite mined in 1905 was exported to Germany.—*U. S. Geological Survey.*

CONCERNING the relative efficiency of the better-class station-pumps underground we have the following data: To raise 500 gal. against a head of 3,000 ft. a compound-condensing pump will consume 1,370 lb. per hour, a triple-expansion condensing pump 1,060 lb. per hour, while a high duty Worthington pump will consume 840 lb. per hour. Compared with the first-named pump, therefore, the triple-expansion pump makes a saving of 22.63% and the Worthington high-duty pump a saving of 38.68%. Taking these various points into consideration the engineer will arrive at the conclusion that for the majority of Western mines the compound-condensing pump is all that is required, while, for shaft-sinking and general prospecting, the ordinary high-pressure pump is the most advantageous.

Business and Engineering.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR RICKARD.

In these days, when the necessity of a good technical training is sufficiently impressed upon the young men who intend to become mining engineers, it may be well to direct attention to the importance of some knowledge of business methods. At the very outset of his career, in his letter of application for a position at the mine or smelter, our young man will be fortunate if he can display some business sense as well as scientific knowledge. The chief who engages him is apt to be impressed as much by one as the other.

The management of a large company is always appreciative of business capability in every department. Great care should be exercised in making out requisitions and in preparing reports, keeping account of supplies, and in systematizing all records, so that a knowledge of existing conditions may be promptly obtained at any time. It is of great importance to see that no shortage occurs at a critical time, or that unnecessarily great quantities of any kind of supplies are carried in stock, particularly those that are perishable or which deteriorate. It is most irritating to the busy mine-manager to have the assayer report a shortage of litharge when it takes twenty days for an order to be filled from the nearest point of supply. It is equally aggravating to find suddenly that a large quantity of ammonia is useless from having been kept in stock too long. All of these irregularities and embarrassments are easily avoided by the application of the simple rules adopted in any business, and it means advancement to the man who can relieve the boss from worry, and a sure setback to anyone who causes needless annoyance. Business men with no other qualifications to recommend them, should not be chosen for mine managers in preference to technical men with some business knowledge and experience; and yet a large proportion of the managers of our largest mining properties have at most only an elementary knowledge of the technical details of the operations under their charge. The typical business mine manager is getting the big salary, and the purely technical men under him are solving his technical problems. Would it not be better to have a technical man at the head of affairs with sufficient knowledge of matters and methods to attend to the larger problems, and to leave to a purely business man on his staff those details of management which prevent him from giving personal attention to the greater problems? The technical man, because of his knowledge, his personality, his high ideals and attainments, should be the leader, and not subservient to the business man, whose judgment of many important matters is likely to be at fault. The length of time and the amount of application necessary to master the ordinary problems of business are as nothing in comparison with the necessarily long period of studious application devoted to the training of the capable technical man. I do not mean that it is absolutely necessary to have a detailed knowledge of every item of the business department, but sufficient to know that he is not being either deceived or imposed upon. A knowledge of the ordinary discounts allowed for cash payments by firms furnishing the mine supplies, and the time usually allowed for such payment; the secure investment of reserve funds; the current prices of supplies—this is information the manager ought to have at his fingers' ends.

A purely technical manager might find out too late that the terms of his contract with a smelter were entirely unsatisfactory even though he had given particular attention to the penalties charged for the presence of arsenic, zinc, or any other deleterious substance in the ore; because he had overlooked valuable by-products for which he receives nothing. An instance may be mentioned where large shipments of pyrite were made to a smelter in the Black Hills. Several months later the mine owner discovered that his ore contained an appreciable amount of copper. On requesting some sort of settlement on account of copper, which was not mentioned in the contract, the miner was informed by the smelter people that they bought his ore for iron and sulphur and had no record of any copper content. On the other hand, the manager who is purely a business man without technical training, and with only limited practical experience in the affairs of mines and reduction works, may be deceived, and failing to recognize the true import to the smelter of the presence of objectionable minerals in his ore, insists upon a contract which [illegible] buyer or smelter superintendent in justice to [illegible]self cannot sign. The inexperienced manager [illegible]owed his strict ideas of business to carry him into deep water, and he has not only made himself objectionable and a disagreeable customer, but has exposed his ignorance, which is worse, for the fact will cripple his ability to direct the company's affairs.

The buying of supplies should be intrusted to a man whose knowledge and experience fit him for this important trust. He must also be known to be above the blandishments of sellers and the possible temptations of his position. It is necessary that the buyer of mine supplies be a competent judge of the quality and usefulness of his purchases, but this is not always the case. I call to mind an instance where the manager of a large newly organized concern bought scores of great picks—the kind known as railroad picks—with huge handles and heavy unwieldy eyes. He bought them at a discount and considered them a bargain, but the miners refused to use them, for which the superintendent, being a practical man, did not censure them in the least.

The purely business man is more often at the helm, not because commercial knowledge alone is the more valuable, but because a thorough business training includes a knowledge of men and their adaptability to certain work, and his business instinct and training have taught him how to employ this knowledge to the best advantage.

PIPES UNDERGROUND.—In many mines it is a great inconvenience, not to say a source of danger, to run long steam-pipes to operate underground hoists or pumps. Such pipes should be well covered to lessen condensation, and to prevent heat in the shaft, which is not only a discomfort, but tends to rot the timbers. Where the use of steam is undesirable, electricity, or preferably compressed air, can be used, the latter being not only safe, but aiding in ventilation and cooling. A compressor plant is needed in any mine to operate air-drills; to increase its size in order to supply, in addition, the air needed to run the underground machinery, will increase the cost comparatively little, and, at the same time, compressed air, in conjunction with proper re-heaters, is a most economical method of power-transmission. The most convenient method of re-heating is by means of steam. A small well-covered steam-pipe may be led to distances as great as 10,000 ft. to the re-heater, which must be, of course, close to the engine. These re-heaters are also made so as to be directly heated by coal, which would naturally exclude them from mines where, as in some coal mines, an open fire would be dangerous. A direct-heated re-heater 42 in. diam. by 54 in. high will heat per minute 340 cu. ft. of free air to 360 degrees F., increasing its efficiency by 35%, the air being under 40 lb. pressure per square inch.

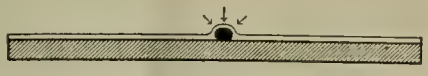
In every mill or mine, the management ought to be able to give a reason for doing anything in a particular way.

Principles Underlying the Amalgamation of Gold in the Stamp-Mill.

Amalgamation is a physical—not a chemical—process, the catching of gold by mercury being almost instantaneous. While this is true with respect to a given particle of gold, yet, with respect to the whole mass of the ore, it is a continuous process.

With the exception of its tellurides, gold occurs as metallic or free gold alloyed with more or less silver, and, frequently, with other metals. The ores of gold are divided into two classes, free milling and refractory. The former may be defined as one in which the gold is in such form that it is readily and completely recovered by crushing and amalgamation, while, in refractory ores, this is not the case.

The purpose of wet-stamping or crushing is to free the gold from its adherent gangue, the pulp, as it passes through the battery-screens, consisting of particles of gangue and particles of free gold, which, mingled with, say, eight times their weight of water, flow over the mercury-coated apron-plates in a film or layer. The metal alone is capable of being wetted by the mercury, the ore particles of low specific gravity not being at all affected. The gold, as soon as it comes in contact with the amalgamated surface, is immediately wetted by it, just as an ordinary substance is wetted by water. The action is assisted by the fact that gold and silver, owing to their greater specific gravity, soon come in contact with, and are wetted and caught by, the mercury of the amalgamated surface. If the particle of gold is less in diameter than the thickness of the mercury film it produces no disturbing effect upon it; if greater, it forms a projecting point upon it as in accompanying sketch.



A liquid, such as this mercury film, has a tendency, due to surface-tension, to provide itself with a horizontal upper bounding surface. In the attempt to do this, in that part of the surface which has been raised up because of the gold grain lying beneath, the pull of the surface-tension, resolved into its components, tends to press down the grain upon the plate with considerable force. This force begins the instant the grain of gold is wetted by the mercury, continuing to operate as the grain is drawn beneath the surface, and constituting the so called 'attraction' of the mercury for the gold. Because of this force, grains of gold adhere to each other and to the plate with great tenacity, especially where the pulp drops upon it.

Gold-amalgam, when freshly made, may be of the consistency of soft paste, yet, after standing a few days, it will become hard and rigid, and so it is with the amalgam forming upon the apron-plate. Any condition which tends to make the gold particles less readily wetted by the mercury has a detrimental effect upon amalgamation. If the gold particle has not been completely separated by crushing, the tendency of the mercury to hold the gold particle may be overcome by the sweep of the flowing pulp-layer upon the adherent particle of gangue. Gold telluride, or gold alloyed with bismuth, becomes incapable of being wetted by mercury and so is not caught. Again, in ores which have been subject to alteration the grain of gold may be coated with oxides, sulphides or base metals so as to be incapable of being wetted. In one case the gold grains were coated with a film of calcedonic silica. Very fine gold may be carried along so rapidly by the film of pulp upon the plate that it does not come in contact with the mercury. To prevent this the apron-plate is given a steeper grade, and as little water is used as is consistent with securing a free movement of the pulp. Such fine particles may have an adherent water or air-film so that they do not come in contact with the mercury, and so are not wetted by it.

Mercury is fed to the mortar in order that, during the violent agitation of crushing, the gold particles may be brought in contact with the mercury and thoroughly wetted. This tendency is increased by the subdivision of the mercury into fine particles; this is termed 'flouring.' By such contact the gold particle is increased in size by the adhering mercury, and is also wetted by it, so that the mercury film of the apron-plate catches a wet particle more readily than a dry one. Disadvantages are, however, introduced by this practice; they are the losses brought about by the 'flouring' and 'sickening' of the mercury. Flouring is mechanical, the mercury by the violent agitation being broken up into small drops, the surface tension of which is enormous, compared with their weight. This keeps the particles truly spherical, so that they come in contact with the amalgamated surface at a point rather than by a line. The tendency of two globules to coalesce, or to sink down to or below the amalgamated surface is slight, so that the drops are swept away and lost. Again, certain minerals will form an extremely fine slime which coats the globules, so prevent coalescence. If a floor, coated with fine dust, have some drops of water sprinkled upon it, a similar phenomenon appears, each particle being coated with dust, taking a spherical form and exhibiting a lively movement when stirred.

Soluble salts in the ore react with mercury, causing it to be lost in solution and precipitating other elements in it, tending to make it 'sick.' This sickness is of two kinds; another metal may become alloyed with the mercury making it less active, or more viscous and brittle, so that flouring may readily be induced. The fine slime also adheres more readily to the surfaces of sick mercury, and the metals in it frequently re-oxidize, forming a coating which prohibits the coalescence required.

The finer the gold the more rapidly does the mercury take it up, so that more mercury is needed to amalgamate fine gold than coarse.

The chief difficulty in the use of plain copper plates is due to the fact that a small amount of copper from the plate goes into solution in the mercury, and this is easily attacked by oxidizing agents, and by soluble salts of the ore, forming a tarnished film of copper-salts on the surface of the mercury, and preventing the gold from being caught. The difficulty is overcome by silver-plating the copper. Silver is less soluble in mercury than copper, and is less affected by the soluble salts above mentioned, and not at all by oxygen. The effect of silver-plating on the absorption of mercury by the copper plate is to restrain it at first, since the mercury has to diffuse the silver; eventually, however, the amount absorbed is approximately the same.

From a physical standpoint the temperature of amalgamation does not matter as long as it remains constant. A disturbance of plate-equilibrium arising from changing temperature is detrimental, since, in such a case, the thickness of the mercury film, as well as the absorption of mercury by any other metal, changes; and the millman then has to deal with varying conditions. Where chemical action is negligible, it might be advisable to conduct amalgamation at higher (but constant) temperatures, since the wetting of the gold particles by mercury is slightly facilitated with a rise of temperature; but a comparatively low one is better where the influence of soluble salts in the ore has to be considered.

Abstracted from a paper on the 'Amalgamation of Gold Ores' by Thos. T. Read, bi-monthly Bulletin of the American Institute of Mining Engineers, May, 1906.

Reverberatory Practice on Lake Superior.

Reverberatory smelting at the copper mines of Lake Superior, as compared with that for the recovery of copper from its sulphide ores, is simple. The people engaged in it have thought that they had a hard problem to solve and have been, in the past, afraid to try anything much different. The mineral, which they had to treat, already contained the copper in metallic form, and its recovery consisted in melting down a self-fluxing material, refining and casting it.

Fifteen or twenty years ago, as Egleston's monograph on the subject tells us, the charge of a reverberatory furnace was 15,000 to 20,000 lb. of copper 'mineral,' concentrated from ore (or 'rock,' as it is there called). Conventional practice today prescribes a furnace that will hold 40,000 lb. of mineral carrying upward of 70% copper. In furnaces of this size not only was the high-grade mineral melted and refined, but even that which was low-grade, containing only 30% copper. Today we find certain furnaces reserved for melting the low-grade mineral, the copper being then tapped out and sent to another furnace for refining. The high-grade mineral is, however, still melted and refined in the same furnace. For the plain melting the furnace has been made larger and capable of holding 70,000 to 80,000 pounds.

With the completion of the Michigan smelting works, near Houghton, Michigan, a different practice has been introduced, resulting in large increase of output per furnace. Referring more particularly to the refining furnaces, which take not only the high-grade 'mineral' and the nearly pure native copper, but also copper from the melting furnace, we find, according to a statement of their early work about a year ago, that they were turning out a maximum charge of 184,000 lb. In the interval they have inclosed the ash-pit of this furnace, 5 by 6 ft. in size, and have introduced an under-grate blast by which they have been able to burn 40 lb. coal per square foot per hour. This has enabled them to reduce the draft over the hearth to 0.25 in. of water against the 0.50 in. formerly used, thus diminishing the quantity of cooling air otherwise drawn to the hearth. Because of the increased quantity of coal consumed it has been possible to melt charges of 230,000 to 240,000 lb. up to a maximum of 298,000 lb. The old plea, that in undertaking to cast such large quantities, the copper would get out of pitch, seems not to have been borne out. Of course this large amount could not have been moulded by the ordinary way of dipping, using either hand-ladles or the larger ones called 'bull' ladles suspended from an overhead trolley. The casting has been accomplished by means of a Walker machine, and a single operator has been able to handle the large charge above mentioned in six hours. Indeed, it requires no great stretch of imagination to predict that in the future 500,000 lb. copper will be refined and cast at one time.

Reverberatory slag has so high a tenor in copper (10 to 25%) that it is always re-smelted in a blast-furnace which will give a slag going 0.75 to 1.00% copper. Reverberatory slags, as low as 7% in copper, have been produced under favoring conditions, and an average of 10% is usual in the best practice. Attempts are being made to make a cleaner slag by the use of reducing agents and by care in proportioning the charge so as to give a typical slag; the results are promising. It may be prophesied that some day it will be possible to produce slags so clean that they will not need blast-furnace treatment and may be thrown away, thus dispensing with the after treatment altogether. This result will again be assisted by the use of the long furnaces of the Anaconda type, recently described in the columns of the MINING AND SCIENTIFIC PRESS.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Nickel is found generally with basic magnesian rocks—norite, serpentine, and rocks containing much olivine. It is usually accompanied by cobalt minerals.

The ore from West Point, Cal., marked Blue Mt., is Mispickel (arsenical iron-sulphide). It may be gold-bearing. This can be ascertained by assaying.

The minerals from T. C., Spokane, are: No. 1, principally Chrysocolla, with Tenorite; No. 2, amount too small to determine, but scales look like molybdenite, rather than tellurium; No. 3, Epidote.

Mid-summer is not a suitable time for those unaccustomed to the desert to attempt to prospect in that region. Now is the time to get into the high Sierra from southern California to British Columbia, leaving Death Valley and other equally hot localities for the winter days.

The rocks from Medical Springs, Ore, are: No. 1, Chert; No. 2, Semi-opal; No. 3, Aplite; No. 4, also Aplite, but stained with iron oxide; No. 5, Grano-diorite with much infiltrated quartz; it also contains iron oxide, and may be gold-bearing; No. 6, another phase of the Aplite.

The rock specimen from Los Angeles, marked F. G., is much altered, but consists chiefly of original hornblende, chlorite and feldspar, mostly much kaolinized, but probably orthoclase. There is little original quartz in the rock. This would determine the rock to be Syenite. There are numerous veinlets of quartz in the rock of secondary character, having no connection with the original rock.

The rocks from Tonopah, Nev., marked J. O. A. S., are: (No. 1 and 2, missing;) No. 3 A, apparently an igneous rock much altered and now consisting principally of calcium carbonate and silica; No. 4 A, Obsidian in which occur numerous feldspar crystals; No. 5 A, Diorite-porphyrite; No. 6 A, a silicified eruptive rock, original character now undeterminable, because of alteration; No. 7 A, a silicified and iron-impregnated rock, probably originally Aplite.

THE following table shows the development of transatlantic steamships in certain directions since the Cunard company entered the field 66 years ago:

	Britannia. 1840.	Umbria. 1884.	Campania. 1893.	Lusitania. 1906.
Coal for trip (tons)	570	1,900	2,900	5,000
Cargo (tons)	224	1,000	1,620	1,500
Passengers	115	1,225	1,700	2,350
Horsepower	710	14,500	30,000	68,000
Coal per horsepower (tons)	5.1	1.9	1.6	1.4
Speed (knots)	8.5	19	22	25

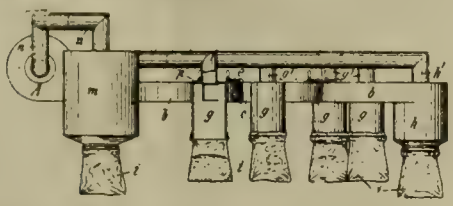
It will be seen from the above table that since the first Cunarder was built 66 years ago, in order to increase the speed threefold the power has been increased 100-fold, and the coal consumption for a voyage ninefold. The coal per horsepower has been reduced, owing to greater economy in use, and the reduction of the length of the voyage from fifteen days to four and a half, which latter is the time estimated for the new boats. It will be noted that, although the Lusitania will carry more passengers, she will carry less freight than the Campania, on account of the room required for coal and machinery due to her higher speed.

Mining and Metallurgical Patents.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

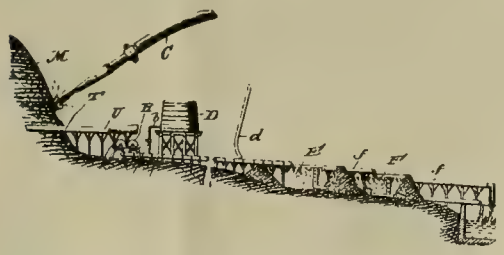
CONCENTRATOR FOR PULVERULENT MATERIALS. No. 821,819. Richard G. Newman, Wandsbek, near Hamburg, Germany.

In a concentrator, the combination with an air-blast, of a serpentine conduit having vertical sides, connected at one end to the delivery end of the air-blast and a pipe connection between the other end of the conduit and the suction end of the air-blast, thereby forming a closed circuit, a dust-collector connected with the said pipe and closed receptacles connected to the conduit to receive the separated material.



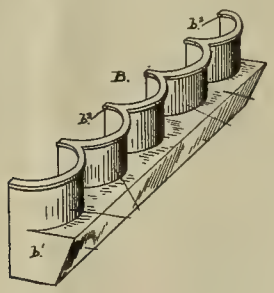
APPARATUS FOR THE TREATMENT OF ORES AND TAILING. No. 822,398. August Soderling, Bodie, California.

Apparatus for preliminary treatment of tailings and slimes, consisting of an inclined riffled trough or conductor having at its upper end a water-supply, and pulverizing-rolls, and a tank holding a weak solution of solvent acids or acid salts, a dilution water-conductor near the lower end of said trough, and at its lower end settling-reservoirs for sands and for slimes, final reservoirs for base-metal solutions and separate terminal reservoirs for the sands and for the slimes.



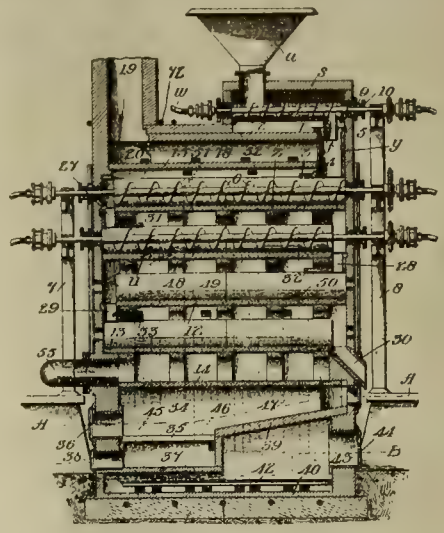
MORTAR FOR STAMP-MILLS. No. 822,914. Martin P. Boss, San Francisco, California.

In a stamp-mill mortar, a mortar-body having an opening in its top provided with an inwardly inclined wall, in combination with a housing composed of separate similar halves, each half comprising a semi-cylinder to receive the stamp-head and a base with a flat inclined outer face to fit the inclined side wall of the top opening of the mortar-body, whereby the two halves are wedged together in seating.



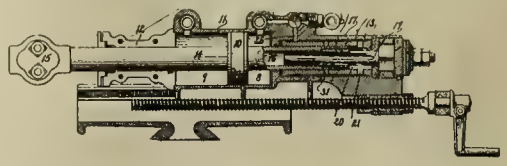
ROASTING-FURNACE. No. 823,393. Arthur W. Chase, New York, New York.

In a roasting-furnace the combination of end walls provided with openings, bridge-walls, a series of substantially U-shaped troughs supported within said end walls, conveyors in said troughs, means for driving said conveyors, a plate provided with circular openings adapted to fit around the openings in the end walls, said plate being provided with slots and removable plates each made in two sections fitting around the conveyor-shafts and adapted to close the openings in the end walls, said plates being adjustably secured to the first-named plate.



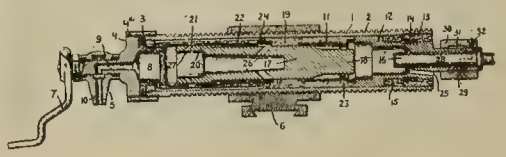
ROCK-DRILL. No. 822,596. Arthur H. Gibson, Easton, Pennsylvania.

A tool-piston having a front rod and a tail-rod, a cylinder having a tail-rod chamber, pipes for feeding motive fluid alternately to the opposite sides of the piston and a single means for bringing the tail-rod chamber into open communication with the pipe which effects the forward stroke of the tool or to the atmosphere at pleasure.



ROCK-DRILL. No. 823,059. E. Letcher, Nevada City, California.

In a rock-drill, the combination as set forth, of a shell, means for turning and advancing said shell, a cylinder within the shell, a fluid-actuated piston reciprocating within the cylinder, an exteriorly shouldered chuck-body separably disposed within the forward end of the shell and abutting against the forward end of the cylinder, a bushing secured in the forward end of the shell, a cushion-ring disposed between the bushing and the shoulder of the chuck-body, and keys engaging the bushing and chuck-body and adapted to permit reciprocation and prevent rotation of the chuck-body and bushing relative to each other.



Special Correspondence.

LONDON, June 20.

There has been some enquiry for Dolores shares during the last few days on news from the mine concerning No. 1 crosscut at the third (bottom) level put through the lode at a point where in January last some high assays were obtained in drifting on the lode. At this point the ore is proved to be 35 ft. wide for an average assay-value of $101. The welcome announcement is also made that at last the cyanide plant is at work, and giving an extraction of 95% of the precious metals. The profit at the mine for the month of April is given as $18,598 from 692 tons crushed; that is before the cyanide plant started running.

The Esperanza dividend of 5s. 6d. has had little effect on the shares, the mining market generally being in the doldrums.

A circular has been issued by the Camp Bird directors explaining the quite unavoidable delay in informing the shareholders of the cost of repairing the damage done by the snowslide and fire. The total will be about £70,000. At the time of the accident cash in bank and on short loan amounted to about £120,000. From the insurance companies £6,600 has been collected, and further small payments are expected. A larger sum was not recovered owing to the fact that the insurance did not cover loss caused by the snowslide, but was confined entirely to that portion of the mill subsequently destroyed by fire. It has been decided to re-build, on the site of the old mill, a 60-stamp mill, making provision in the building for a further 20 stamps, and to erect snow barriers. It is expected that crushing will be resumed early in December. On receipt of the report and accounts, the directors hope to meet the wishes of a large body of the shareholders by resuming the payment, at least, of small dividends during the time occupied in re-building the mill.

A notable example of "linked sweetness long drawn out" is to be found in the Linares Lead Mining Co., Ltd. It was first registered as an English company in 1852, and is now undergoing reconstruction on modern lines with shares of £1 each, instead of £3. On its modest capital of £45,000 the Company has paid considerably over a million sterling in dividends.

Another reconstruction now in hand, but of a very different category, is that of the Um Rus Gold Mines of Egypt, Ltd. After being in operation for about 3½ years without attaining a dividend-paying position, the Company is short of working capital. The mine is said to be opening up in a most promising way. The ore reserves are put at 10,000 tons of fair milling grade. The results of this Company, one of the best which came on the scene with the advent of the new regime in Egypt, are not such as to inspire confidence in the future of that country as an important gold-mining centre.

A report covering 18 months' operation has been issued by the Akrokerri (Ashanti) Mines, Ltd. It states that gold to the value of £90,560 has been won during the 11½ months since the mill started, as a result of crushing 18,270 tons. The actual running time was 244 days, the greater part of the time lost being due to lack of fuel, and fire in the native village. The directors were able to obtain a reduction of the prohibitive rate of 51s. 3d. per ton for the carriage of coal fuel from Sekondi, to 15s. 1d. A reserve stock of coal has now been accumulated at the mine. The railway rates on machinery, stores, etc., are still exorbitant, and the directors are continuing to make representations, although, so far, with little success. The net profit is £8,872, after writing off £14,425 for depreciation and a further £23,751 for mine-development redemption, equivalent to 26s. per ton on the 18,270 tons of ore milled. This figure of 26s. per ton has been arrived at by dividing the total cost standing to the debit of mine development at December 31 last by the tonnage of ore in sight in the mine at that date, added to the tonnage extracted and milled during the year. Since that date, however, development has proceeded much more rapidly and economically. The total tonnage in sight and estimated in the mine at April 30 was over 50,000 tons. The cost of development at the present time has been reduced to 14s. 6d. per ton, and it is fully expected that this figure will, as time goes on, be continually reduced until it reaches a normal level of, say, 7s. 6d. per ton. The net profit shown is also subject to a royalty of five per cent to the Gold Coast Government, as well as to assessment for income-tax in this country. Two winzes have been sunk to a depth of 95 ft. below the third level, and the fourth level is now being driven at this depth, and will be completed much more rapidly than the upper levels, as the work is being done by means of air-drills. The directors are adding to the existing plant an additional powerful air-compressor. The opening up of the northern workings has also received special attention, in view of their bearing on the question of increasing the capacity of the mill. The general power-plant is designed for working 40 stamps, although only 20 stamps have, so far, been erected. The intention has been to install these additional 20 stamps and correspondingly to increase the capacity of the cyanide plant as soon as the development of ore reserves, both at the southern and northern workings, justified the doubling of the extraction. It is estimated that the total cost of installing this additional plant will not exceed £8,500. During the five months from January 1 last 9,810 tons of ore have been crushed, yielding £47,087. Providing this same rate of production is continued to the end of the year, the value of gold recovered would be about £20,000 greater than during 1905, and should the extra 20 stamps be ready for work in December or January next, it is confidently believed that a profit of £10,000 per month, after deducting all charges, including mine development, will thenceforward be made.

For a development and exploration company having a capital of nearly £300,000 (including debentures) the profit for the year 1905, £24,000, of the Consolidated Gold Fields of New Zealand is not of striking importance, especially having regard to the variety and extent of the Company's mining operations. With regard to recent legislation affecting the mining industry of the country, the following paragraph in the general manager's report is noteworthy:

"It is with great regret that I have to comment on the legislation which has recently come into force under the heading of the 'Bank to Bank Clause.' This clause will have a very serious effect on the Golden Fleece mine, for under the old conditions employees used to walk in and out of the mine in their own time, the distance being approximately 1¼ miles each way. The shifts then relieved one another at the shaft, but under the 'bank to bank' conditions a man's time commences from the time he enters the mine. This has the effect in this mine of reducing the net working time the company is entitled to, from 7½ hours to 6½ hours, a very serious loss, which will have to be deducted from a very slender profit."

The first annual report of the reconstructed Great Boulder Main Reef, Ltd., from the date of the Company's incorporation, Feb. 25, 1905, to Feb. 28, 1906, states that Mr. Albert Wauchope was appointed general manager in place of Mr. W. W. Barton, taking charge on March 1 last. Since the general clean-up in the early part of 1905, the treatment plant has not been worked, exploratory and development work only having been carried out. At the time the Company took over the property the main shaft was down to a depth of 1,400 ft.; since then it has been sunk to the 15th level (1,550 ft.), and thence to the 16th level (1,700 ft.). From the development of these levels, the manager considers the prospects distinctly encouraging, and if the orebodies as disclosed by the drifts and cross-cuts fulfil expectations, the working capital in hand should prove sufficient to both reconstruct the plant, and to place the mine upon a payable basis. The manager reports that in the upper levels there still remains a quantity of payable ore which, when the plant has been brought up to date, can be treated at a profit.

The conversion of two of the leading Cornish tin mines from the 'cost book' to 'limited liability' was formally confirmed by shareholders' meetings last week. Grenville United Mines, Ltd., will have a capital of £60,000 in shares of £1 each, 10 shares for 1 of the old company, and South Crofty, Ltd., a capital of £20,000 in shares of £1 each, in lieu of the 6,120 old shares.

It is stated that The Sudan Exploration, Ltd., is going into Cornish tin. The board is said to have under consideration a number of tin propositions in Cornwall, and announces that it has now secured leases and agreements for leases upon eight setts, containing about 1,200 acres, which form an im-

portant tin mining area. It is hoped that tin in Cornwall will prove a more payable proposition than so far has been the case with gold in the Sudan. It would appear that the boom in tin has awakened considerable interest in other minerals known to exist in the county, notably that of pitch-blende, antimony, zinc-blende and copper. A pitch-blende property near St. Ives is said to have been taken up by a group with a view of working the mine for copper and tin in addition to that of pitch-blende, of which a good vein is now laid open at the adit-level. This property was worked some 60 years ago under the name of Trenwith. An antimony proposition is being worked by a group of local people near Padstow. The prospects here are considered to be of a highly encouraging character, as a good quantity of the mineral has been raised. And at Bolingey, near Perranporth, operations on a fairly extensive scale are being vigorously pushed on, with a view of finding copper beneath a very rich course of blende. The Company is now sinking the shaft with a powerful pumping plant and other necessary requirements are being provided for fully proving the property.

JOHANNESBURG, June 4.

This city has had its full share of discreditable mining fiascos since the war. First there was the Coronation Syndicate, which a few years ago was going to do wonders in the Heidelberg district. Today they have given up Heidelberg, and are trying 'to strike oil.' Then came the Madagascar bubble, when the samples of the reporting engineer were salted so successfully that he issued one of the rosiest reports ever made. This proved a complete swindle. A few months ago we went through the Geduld affair, when the first samples from that mine were salted, sending up the shares. Just recently we have seen the collapse of the Louis Moore, a small mine in the northern Transvaal, reported to have bright prospects. Lastly, but worst of all, comes the terrible disappointment of 'Sallies.'

One of the chief assets of South African Lands (Sallies) was supposed to be the tin mine at Vlaklaagte. About a year ago Sallies was the favorite horse on the Stock Exchange. The rise of the stock was sensational. The £1 shares mounted to £8 10s.; but today you can buy them for 6s. 9d. It was declared by a few and believed by many, that Sallies tin mine would prove the greatest of its kind in the world. Today it is not far from a collapse. All kinds of reports were made on Sallies by all kinds of men, from the highly poetical, imaginative romancer, to the level-headed, cautious mining engineer, desirous of getting at the truth. Perhaps the gem of this collection is this extract from a report of W. Bettel: "Owing to the nature of the lode or 'stock-work,' the expenses, mining and metallurgical, incidental to the extraction and refining of the metallic tin will be very small, and it may be found that the output will require control to prevent undue depression of the tin market. I believe that the enormous extent and value of this stanniferous deposit is barely exceeded in importance by the deposit of gold in the Witwatersrand formation." For optimistic gush this takes a lot of beating! Great things were promised shareholders as soon as the mill commenced operations. The results show a very serious discrepancy from what was promised. The total amount of material won so far is about 25½ long tons of cassiterite, equal to 17.85 tons or 1.75% metallic tin from 1,020 tons treated. The directors appointed two engineers to make a report on the discrepancy. "Gross carelessness" is the strongest term used in the report. What the public want to know is why many men 'in the know' commenced off-loading their shares months ago, while stoutly maintaining that Sallies would prove the greatest tin mine known.

The Sallies collapse will be a heavy blow to the legitimate mining of base metals in the Transvaal. People hoped that Sallies would be the beginning of a great base metal industry in this country, but the failure of this tin mine will depress the enthusiasts. One of the curses of mining in the Transvaal is the close relationship between the Stock Exchange and the mine. Some unprincipled men look upon mining solely as a legitimate form of gambling. A small prospect is found; an 'expert' whose favorable opinion can be bought for a few shares, goes off to visit it in a motor car, and returns the same day with the report that it is the "greatest thing on earth." The prospect is pronounced a full-fledged mine and floated. The shares are eagerly taken up, the sharks get the money, and the public gets—left. Every mining community has such disreputable episodes. The Transvaal seems to have had more than its share of late. These fiascos bring the country into disrepute, quite undeserved, and cripple legitimate prospecting and mining.

TORONTO, July 1.

On June 25 Chancellor Boyd rendered judgment in the action brought by the Government of Ontario against Edward C. Hargreaves and the White Silver Mining Co., to set aside leases of Cobalt mining lands, on the ground that they had been obtained upon false declarations of valuable mineral discovery. The case excited great interest on account of the fact that it is likely to form a precedent in the disposal of many similar cases, and owing to the large number of witnesses examined, the trial lasting for ten days. The decision turned principally upon the evidence of George Haines, the prospector, who swore to the discovery, but the judge considered it too contradictory to support the claim and accordingly gave judgment for the Government, holding that they might cancel the lease, but must indemnify the holders for actual expenditures incurred. The property affected by this decision comprises 120 acres of valuable mineral land near Kerr lake and about two miles southeast of Cobalt town. An appeal has been taken from the judgment, which is having a very disquieting effect, as there are a large number of claims, which have been disposed of by the original holders into the hands of individuals or companies actively engaged in development of equally doubtful validity.

Considerable dissatisfaction with the provisions of the new Mining Act prevails in the Cobalt camp, and a number of petitions are being prepared and mass meetings called in Cobalt, Haileybury and New Liskeard to bring pressure to bear upon the Government. Some wild talk is even indulged in, of the secession of New Ontario from the Province, and the establishment of a new provincial organization; but this is not taken seriously. The principal objections taken are to the inspectorship system, which, it is claimed, gives the inspector too much arbitrary power. There is no absolute standard of the value which a claim must show in order to satisfy the inspector, and it is asserted that many claims have been rejected, which have afterward turned out to be rich. The strongest protest is made against the system under which there are two or three applications accepted for the same claim. It is often the case that after a prospector has spent time and money on a claim and, becoming satisfied with the indications, is prepared to go on with development, the inspector refuses to pass it. Others then come on and continue the work and in the end secure the title. The miners ask for stability of title at every stage, and denounce the practice of permitting several applications to be under consideration simultaneously as an encouragement to claim-jumping.

Discoveries continue to be made in the region north of the Cobalt area. In the Wendigo Lake district, some 25 miles north of Cobalt, three young prospectors have made a good find assaying 23% silver. An eight-inch vein of cobalt, showing silver and nickel in paying quantities, has been found on the Blanche river, eight miles below Tomstown. A good vein of molybdenite has been discovered in the Temagami forest reserve.——The Nova Scotia mines in the Cobalt area have struck a 12-in. vein carrying 50% silver at a depth of 70 ft. Other veins on this property show increased richness as lower levels are reached.

Shipping and trenching work is being actively pushed on most of the old mining properties of the Cobalt camp, and good finds are matters of almost daily occurrence. On the Columbus-Cobalt property three important veins have been found in addition to the six-foot lode of cobalt that is being worked. This is the only mine in the district yielding cobaltite, and the ore carries a high percentage of silver combined in an unusual manner with cobalt. A 100-ft. shaft is being sunk and 100 ft. of driving is going forward, the work being pushed day and night.——Numerous accidents from blasting, drilling, etc., are occurring, which are largely due

to the ignorance or inexperience of many of the men employed, who are new to mining.

SALT LAKE, July 1.

The ore and bullion settlements reported for June by Salt Lake banks aggregated $2,056,300. The month was an unprecedentedly active one in the camps and both the United States Smelting, Refining, & Mining Co. and the Utah Consolidated Co. reported the largest single month's bullion output in their history. The Utah Consolidated produced about 2,000,000 lb. copper.

Samuel Newhouse has closed a deal whereby he comes into possession of something over 100,000 shares of stock in the Silver King Consolidated Mining Co. at Park City. This property is situated near the Silver King mine, of which former U. S. Senator Thomas Kearns is manager. At a meeting of directors last week, Mr. Newhouse was made vice president of the Silver King, and Lafayette Hanchett, manager of the mines, was made a director. Samuel Newhouse has also secured an option on the Commoner and other properties at Silver City, Idaho, and M. M. Johnson, his chief field representative, has returned from making an examination of them. The property tied up is situated on War Eagle mountain.

The Honerine Mining Co., operating at Stockton, Utah, has succeeded in inducing the managers of the American Smelting & Refining Co. to make certain modifications in their contract. Some time ago the Honerine management contracted to deliver the output of the mine for a period of five years, but the conditions of the instrument turned out to be not altogether favorable to the mining company; now that the changes have been made, it is expected that production upon an elaborate scale will be undertaken.——The New Stockton mine has its shaft down to 1,000 ft. and is running for the orebodies on that level. The mill is treating 60 tons of ore daily, working two shifts, which is all that can be done with the plant because of water shortage. The company is likely to build an aerial tramway to the valley below and there provide new facilities for concentration and power. The New Stockton mine contains some extensive bodies of mill-ore. J. J. Trenan of Salt Lake is manager.

The ore shipments from the Tintic mining district last week aggregated 130 carloads, the shippers and amounts being: Ajax, 3; Beck Tunnel, 5; Black Jack, 7; Bullion Beck, 8; Carisa, 8; Centennial Eureka, 33; Dragon Iron, 8; Eagle & Blue Bell, 3; Eureka Hill, 14; Gemini, 5; Grand Central, 6; Godiva (concentrate), 2; Mammoth, 4; May Day, 1; Ridge & Valley, 3; Scranton, 4; South Swansea, 1; Swansea, 3; Yankee Con., 4.——The Bullion Beck & Champion Mining Co., after a lapse of eight years, has appeared among the list of dividend payers again, the directors having distributed $10,000 this month, making a total of $2,700,000 paid out by this company during its existence.——Recent developments on the lower levels of the Mammoth mine have been of an important character. At 2,269 ft., the bottom of the mine, assays taken across a full breast gave returns of 11% copper, 22 oz. silver, and $20 in gold.

Papers have been filed effecting the legal consolidation of the Goodsell and Imperial properties in American Fork canyon. The new company is known as the Mountain Dell Consolidated Mining Co., and the officers are: President, J. H. Wotten, American Fork; vice president, W. L. Goodsell of Salt Lake; treasurer, A. W. Raybould of Salt Lake. The management of the Utah Copper Co. has decided to provide a more extensive power equipment for its Garfield mill than the original plans called for. It is the intention now to install a plant of 10,500-h.p., which will not only supply the mill with electric energy, but also the company's mines at Bingham. The cost will be about $750,000.——The campaign for the removal of the overburden from the copper-bearing porphyry ores of the Boston Consolidated at Bingham is progressing favorably. A Keystone driller is in operation and, with it, holes are being sunk to depths of from 20 to 35 ft. About 40 holes are to be drilled, when a carload of black powder will be used to fill them. The ensuing explosion will shatter the surface so as to facilitate the work of the steam-shovels.——About eight feet of good shipping ore has been opened in the vein recently encountered on the 200-ft. level of the Montezuma mine.——The mill of the Ohio Copper Co. is now equipped with a battery of 20 concentrating tables, four of the Johnston type having just been added. The company is preparing to equip its mine so as to work to greater depth and get out larger tonnage.——At a special meeting of shareholders of the Utah Apex Mining Co., also operating in the Bingham district, the action of the directors in authorizing a $500,000 bond issue, was ratified. Only $100,000 worth of these bonds will be issued at present, the proceeds to be used in building an aerial tramway, a new compressor plant and for development purposes. A long adit is being driven to tap the veins at depths of from 800 to 1,000 ft. The tramway will be used from the mouth of the Andy tunnel, one of the upper workings, until the adit is finished and connections made with the developed portions of the mine.

The equipment of the New Red Wing mines, operated by the Utah Development Co., which was contemplated for this summer, has been delayed at least until autumn. It is intended to erect a plant to treat 500 tons per day. In the mine some extensive bodies of low-grade ore have been found.

The ore shipments from Park City to Salt Lake smelters last week aggregated 4,667,460 lb., the shippers and amounts being: Daly-Judge, 1,078,000; Daly-Judge (zinc middling), 575,000; Daly-West, 1,140,000; Kearns-Keith, 219,000; Silver King, 1,148,460; Little Bell, 458,000; Jupiter, 49,000.——The Jupiter mine is to be equipped with a small mill, the management having purchased a second-hand plant.

At Alta much development work is being done and production is steadily on the increase. The Columbus Consolidated is the principal shipper at the present time. A new producer is the Silver King, which is marketing about 20 tons of ore per day. The Con. Flagstaff will soon have its new compressor plant ready for operation, but the management is continuing the adit into the mountain in the meantime by hand. Seven fissures have been encountered, the last one being cut last week at a distance of 1,290 ft. from the portal.——The Albion Co. continues to carry on its campaign of development with encouraging results, and is preparing to build a mill, if not this year, then in the spring of 1907. William Hatfield, of Provo, is the manager.

It is announced at Pioche, Nevada, that a consolidation of the Bristol and Hillside companies' possessions has been effected, the new company to be known as the Bristol Consolidated Mines & Smelters Corporation. Strong Eastern people are behind the Enterprise, and the combined properties are to undergo extensive development preparatory to providing facilities for ore treatment. The Bristol company has been shipping ore regularly to the plants of the American Smelting & Refining Co. at Salt Lake.

DENVER, July 2.

Another regrettable lawsuit has been started at Cripple Creek. Judge W. S. Morris, of Colorado Springs, as attorney for the Jennie Sample Mining Co., has brought suit against the estate of James J. Cone, owner of the Ophir mine, for $200,000, alleging that this amount of ore was extracted from a vein apexing on the Minnehaha claim of the Jennie Sample Mining Co. It is evidently the same old apex question again. Cripple Creek is a perfect complex of veins. As a man who has had considerable experience in apex suits once remarked to me: "I can apex any vein in Cripple Creek anywhere it is wanted." There is a lot of truth in this remark. Within 100 ft. of the surface one can mine in almost any direction, following some sort of a vein or crevice all the way, simply by selecting the veins or crevices that go in the direction that one wants to go. Of course the experienced mining men of the camp draw a very sharp distinction between the series of veins that have been found to be ore bearing and the countless other seams which are barren. Unfortunately all veins look alike to the average jury and the decision of an apex suit is just as apt to go to the impostor as to the rightful owner. Many of the Cripple Creek mines have had the good sense to eliminate trouble by agreeing among themselves that the boundaries of their claims shall define their property to indefinite depths. Nor is this custom confined to Cripple Creek. The same rule has been adopted to good effect in the Morenci district of Arizona. Such action speaks louder even than the resolutions of the American Mining Congress, that the American

miner is thoroughly disgusted with the apex law and wants some more simple rule by which he may acquire government mining property.

A mining district of promise has been discovered on the Uintah reservation, in Utah, not far from the Colorado line. The formation consists of upturned limestone beds seamed with dikes of trachyte and other eruptive rocks. The mountains are quite high and the underlying granites and quartzites have been thrust to the surface near the top of the range. While but little prospecting has as yet been done in the high hills, some extremely rich ore has been found, and it is thought that the granite and quartzite area will be found to contain profitable lodes.

The famous old Caribou district is to be re-opened by a long adit from Cardinal, if the plans of Col. S. B. Dick, of Meadville, Pa., are carried out, and as Col. Dick has fulfilled his purpose heretofore, it is quite probable that this enterprise will go through. If it does, it will mean a great deal for western Boulder county. The Caribou mine is credited with a production of $6,000,000 in silver. It was finally closed down in 1896 on the advice of T. A. Rickard. Since then the price of silver has gone up and,the price of mining and ore reduction has gone down, and while I do not know that there is any great amount of low-grade ore actually blocked out, it is more than probable that there is more than one big orebody in the district. The lowering of the water-level will facilitate the prospecting of the ground.

There is a district west of Granite, Colorado, which promises to become a producer. J. Loggin, of the Twin Lakes placer, showed me a lot of the ore and gave me information concerning the district which convinces me that there is merit to it. The following, from the *Mining Reporter*, tells part of the story concisely: "Not since the first mineral discoveries at Leadville has the outlook for the Twin Lakes district been so bright as it is today. Electric and steam plants are to be installed, and at least two mills will be installed and operated this summer. One is being erected by Judge Harrison, Fred Robinson and others, of Leadville, at the base of Champion mountain, in Lackawanna gulch. This gulch is near the very summit of the Continental divide, and, notwithstanding the rich ore found on the mountain sides, it has been kept back owing to the high altitude and difficulties of transportation. Better weather conditions have inaugurated an era of activity in this part of our district. Several four-horse teams loaded with a crusher and other machinery went there last week, the old Bromley mill has also been purchased and will be moved soon; also another mill was transported last fall, and the whole combined will soon furnish an up-to-date reduction plant. A romantic history is connected with this claim. More than a score of years ago, when Lackawanna had an incipient boom, a Missourian by the name of Roberts located the Miller vein and opened an extremely rich body of free gold ore. Owing to unforeseen circumstances he had to leave suddenly and return home; but, before his departure, he drew a rough sketch of the mountain and of the valuable deposit. He never returned, but several years later his nephew, having received the map, came to Twin Lakes to recover the property, to find that during the interval the Robinson brothers had relocated the abandoned claim, resulting in a lawsuit that finally ended with a compromise. The present owners have opened a four-foot vein, from which several rich shipments have been made. Adjoining the Miller lode lies the old Dick Turpin claim, from which in the past several thousand tons of float have been shipped. The writer, when inspecting this property, found on the surface many specimens of quartz showing free gold. This claim is owned by Tingley S. Wood, a prominent mining man of Leadville, and forms a part of his Theodolite group, extending into Half Moon gulch, it being one of the best mining propositions in Lake county."

There are now two dredges working in the Iron Springs placer field, near Steamboat Springs. The new Blivens dredge is reported to be successful.

The snow is leaving the high ranges very slowly. Last year I started teaming to a property I am working at an altitude of 11,140 ft. on June 20; this year, it will be after July 4 before the first team can get through. Notwithstanding the late season, there is an unusual amount of prospecting being done this summer, and I have information of important discoveries from all over the State. Not a few of these stories are coming from the country traversed by the Moffat railroad, which, in a general way, means northwest Colorado. The information in most cases is not sufficiently confirmed to warrant publication, but there can be no doubt of the conclusion these stories indicate when taken in the aggregate, namely, that this year is to be one of many new and important discoveries.

BISBEE, July 2.

The consolidation of four of the Bonanza Circle companies is still commanding the most attention in this district. The new company has not, as yet, got matters thoroughly in shape. Among the companies consolidated, the Lake Superior & Pittsburg has made the best showing. In both of its main shafts large bodies of ore have been encountered. On the 1,100 level in shaft No. 3, a large orebody, consisting mostly of carbonates and oxides, was opened up; this ore averaged 16% copper. The Jessie, Iron Cap, South Bisbee and Glencairn claims have also been proved to be rich. The second company of the consolidation is the Pittsburg & Duluth. Its shaft has been sunk 1,400 ft., and the main levels are at 1,200 and 1,350 ft. The principal orebody is on the 1,350 level, where a large body of sulphides has been opened up. Pittsburg & Duluth has been shipping 125 tons per day to the Calumet & Arizona smelter at Douglas. The third company is the Calumet & Pittsburg. The Calumet & Pittsburg had much trouble with water and it took a long time to get pumps that were able to handle the flow, but since that has been accomplished things have been progressing in a most encouraging way. On this property are two shafts, namely, the Briggs and the Hoatson. Drifts have been driven at various levels in each, and ore has been encountered in nearly all of them. The remaining company of the consolidation is the Junction, which has one shaft that has been sunk 1,200 ft. On the 1,000-ft. level the development is in a large body of oxidized ore. All of these companies have installed modern machinery and equipment. With this showing the Superior & Pittsburg Co. starts on its career.

The Copper Queen Co. will install a central electric plant to supply its mines at Bisbee and its smelter at Douglas. The improvements at the smelter are well under way. The smelter is still turning out copper at the rate of 8,000,000 lb. per month. There is some talk of the Phelps-Dodge Co. erecting a concentrating plant at their Nacozari mines, but nothing is settled as yet.——The Calumet & Arizona smelter is turning out 1,200,000 lb. copper per week.——At the Shattuck property, on Friday, the drift on the 700 level broke into a body of black sulphide ore, which assays 25% copper. Stoping will commence at once. This body of ore, and those opened up on the 300 and 500-ft. levels, make the Shattuck one of the richest in the district. —— At the Denn-Arizona the drifts on the 1,000-ft. level are still in porphyry. The drift to the southeast of the diamond-drill bore has passed through the conglomerate and is now in limestone. The flow of water increased a little this week, but not enough to cause inconvenience. There are new pumps ready that it is thought will take care of all the water that is likely to be encountered.

Sinking and driving are still going on at the Cochise with no new important developments.——The Chiricahua Development Co., in Paradise district, has shut down and it looks very much as if this property would revert to Captain Burns, the owner, in September, when the last payment is due. It is a good district, and it is to be hoped that should this occur, operations will be resumed under a new management. —— The Elwell Gold Mining Co. has commenced operations in the Huachuca mountains. Machinery, supplies, and men are on the ground. George R. Welborn, president of the company, is supervising the arrangements. —— The American & Development Co. in Sonora, Mexico, passed into the hands of a receiver this week, as a result of the long-continued squabble among the stockholders. —— Developments at Tombstone are encouraging. The water is gradually being controlled, and 450 men are working steadily. The ore shipments are being increased appreciably, and the cost of treatment steadily decreased.

CANANEA, Mexico, June 30.

A body of silver-lead ore has been encountered in the main shaft of the mine of the Cubana Consolidated Copper Co., which is situated near Arizpe, about 40 miles south of Cananea and 85 miles from the Arizona border. This is on the 135-ft. level; cross-cutting has been started to determine the extent of the orebody. The ore is being sacked and will be shipped in carload lots as soon as ready. The property of the company consists of about 500 acres.——Ore averaging 8% copper and carrying about 25 oz. silver has been found on the 100-ft. level of shaft No. 2 of the Cananea-Duluth Copper Co.'s property. A drift was started last week to determine the extent of the orebody and the 35 ft. of drift is all in the same ore. From surface indications it is expected that this orebody will develop a width of over 300 ft. Work has been discontinued on shaft No. 1 until the hoisting machinery arrives, and it is expected that it will be ready for sinking within two weeks. An offer of $250,000 is said to have been refused for this property last week. It is considered one of the richest of the Cananea camp and is on the south end of the Cananea 'ore-zone.'

Shaft No. 4 was started ten days ago on the property of the Oro Maximo Mining Co. at Basaitequi, 40 miles southeast of Cananea. The shaft was sunk on one of the richest croppings on the property and has more than come up to expectations. It is now down about 35 ft. and is in ore running $650 per ton. Cross-cuts will be started on the 100-ft. level and are expected to show the lode to be over 15 ft. wide. The two other shafts, which are down over 300 ft., are in ore giving assays of from $150 to $1,000 per ton. This is the largest gold property being worked in the district, employing about 250 men and using the latest mining methods such as air-drills, etc. The final load of timbers for the 200-ton mill left Cananea this week for the property.——Native copper has been found in the prospect shaft on the Bonanza lode of the American Mining Co.'s property, which is situated in the Cananea ore-zone at about one mile from Cananea. In the Bonanza shaft the body of ore which was reached two weeks ago and which runs as high as 48% copper, with an average of 35%, continues to increase, and it is the intention of the management to ship 1,500 tons of this monthly as soon as it is opened up. Five tons of this ore are being shipped daily to the El Paso smelter.

Regular shipments of from 150 to 200 tons per day are being made from the Copper Queen Co.'s Sierra de Cobre mine to the Douglas smelter. This mine is situated in the midst of the mines of the Cananea Consolidated Copper Co. and is one of the richest mines in the district. The ore runs about 5% copper. The development work has been going on for two years and at present there are 100,000 tons of this 5% ore in sight.——The Axurite shaft of the Fortuna Mining Co. has encountered copper-silver ore averaging $550 per ton and the cross-cut, which is 9 ft. long, has shown the orebody to be large. The full extent of it has not been determined, but there are over 200 tons in sight. One hundred tons will be shipped as soon as possible. The property is situated near Arizpe, about 45 miles from Cananea.

In the drift on the 100-ft. level of the Ortega Mining Co.'s property, ore running 6% copper and carrying 18 oz. silver has been found and the drift for 45 ft. is in this ore. The ore is being sacked for shipment and will be sent to the smelters as soon as the management can make arrangements. The property is situated in the Manzanal mountains, about six miles from Cananea.

BUTTE, July 3.

The East Butte Mining Co. will have its entire new surface plant completed and ready for use within the next four weeks. The new hoisting engine is in place and the headframe is being erected over No. 1 shaft, which is down 425 ft., and a cross-cut is being run north and south from the 400-ft. level. It has reached a point nearly 100 ft. south and 50 ft. north. Double that distance will have to be gone before any of the known veins are reached. The cross-cut will be driven through the entire width of the company's ground and will intersect 20 veins. At the extreme southern end another shaft is being sunk and is nearly 200 ft. deep. It will connect with the long southern cross-cut, and the ground to that depth will be opened for mining. The company's tributers, working in six shafts, are hoisting 200 tons of ore per day, yielding an average of 7% copper. The company is paid a royalty of 25%, and the June income from that source was $15,000. —— The North Butte Co. has purchased from James A. Murray the Adirondack mine, a small fraction lying between the Speculator and Edith May, paying $150,000 therefor.

The Red Metal Company has resumed work on the Nipper mine, and has contracted with the Parrot Company to hoist through the shaft of the latter company.——The Reins Copper Company has run its cross-cut from the 1,200-ft. station of the Combination mine to the northern limit of the claim without encountering a lode. A small vein had been cut at the 800-ft. level, but it evidently pinched or is faulted. The company will probably make an opening farther to the east and cross-cut again in the hope of striking a vein.—— The Pittsburgh & Montana Copper Co. is shipping between 100 and 125 tons per day to the Washoe smelter. The company is not making money at present, but since it quit operating its own smelter it is not losing any.

The Butte-Milwaukee Mining Co. has begun work on the Pollock, one of its group of claims northeast of the city. A hoisting engine with a capacity to work to a depth of 1,500 ft. is being installed, and as soon as the machinery is in place, the shaft (which is 350 ft. deep) will be unwatered. A tunnel connects with the shaft at a depth of 100 ft. and the water will be pumped into this adit. The company owns the Pollock mine, and is in position to take up the bond on the Florence. It also controls the Colonel Sellers, Bird and several other claims. There are three veins on the Pollock; one of them is close to the shaft and is the only one on which work has been done.——Butte and Michigan men have organized the Ida-Montana Development Co. The company has under lease and bond two claims known as the Ida and A & B, situated a short distance south of the mines being developed by the Lewisohn General Development Co., southeast of the city. The Ida has been opened by a shaft which is 100 ft. deep, at which depth some fairly good copper and silver ore was struck. The options on the properties provide that $175,000 shall be paid in cash for each claim and one-fifth of the stock to be issued.——The shaft of the Bullwhacker mine has reached a depth of 215 ft. It is the intention of the company to run a cross-cut at 400 feet.

Among the active new companies in this district are the Butte & Bacorn, Butte Copper Exploration, Butte & Hercules, General Development, Butte-Milwaukee, Butte Copper, Butte & Veronica, East Butte Extension, Butte Central Copper, Calumet & Butte, Butte & St. Louis, Butte & London, Butte-Montana, Reins, East Butte, Bullwhacker, Butte & Michigan, Butte & Summit Valley and the Eagle. Forty or more others have been organized during the past year but are not doing anything.——The Butte-Montana Co. has begun work on the Little Annie mine, the shaft of which has been sunk to a depth of 200 ft. The company also has an option on the Alex Scott, adjoining the Leonard mine of the Boston & Montana. The new machinery at the Butte & Summit Valley Co.'s claims has been installed and sinking will soon be resumed. The shaft on the Saratoga is down 50 ft.——The new hoist on the North Butte was put in operation last Monday. It is one of the largest engines in the district.

Thirteen companies operating in this district produced, during the twelve months ending June 1, 4,467,917 tons of ore and other companies averaged about 250 tons per day, making the total 4,599,167 tons for the year. It is estimated that the present rate of increase will bring the total for the year ending June 1, 1907, up to 5,100,000 tons. The North Butte alone expects to increase its output 146,000 tons, and the Red Metal (Butte Coalition) and Anaconda companies will increase their outputs nearly one-third. Among the new companies not yet producing, but which are expected to be shipping ore within six months, are the Butte Copper Exploration Co., Butte-Milwaukee Co., Butte Copper Mining Co., and several others. The big companies referred to last year made gross earnings amounting to $52,328,662.

The shaft on the Butte & London Co.'s claim, the Greendale, has reached a depth of 430 ft. A station was cut at 400 ft., and a pump with a capacity of 400 gal. per min. was

installed. The company has built an engine house, has installed its new engine and the boilers are now being set.——The three shafts of the Butte & Bacorn are now going down rapidly after much delay. The compressor at the Belinda mine has been installed and will furnish air for both the Belinda and Calumet, pipe connections having been made between the two shafts. The bottom of the Belinda shaft is now in country rock, the vein having pitched out of the shaft to the south.

While excavating for the foundation of a building on West Granite street, adjoining the courthouse a few days ago, the apex of a copper vein was exposed five feet below the surface. Samples assayed nearly $100 in silver and copper per ton. The vein is 10 ft. wide, and has a northwest-southeast strike; it is on the Thomas claim, of the Davis-Daly Estate Co. The Thomas lies just south of Clark's Original mine, from which a cross-cut 3,800 ft. long will be run at a depth of 1,800 ft. for the Davis-Daly Co. by the Clark Co. The cross-cut will run through the Thomas lode.

The smelter of the Montana Ore Purchasing Co., which was acquired by the Butte Coalition Co. when it purchased the Heinze interests from the United Copper Co., will be shut down in a few days and will be dismantled. The new owners have been running the smelter since the first of February, but it has not been an economical plant. Amalgamated experts, who examined the smelter after the Butte Coalition came into possession of it, condemned it at once, and, after several months of operation, it was decided to abandon and dismantle it. Ore shipments ceased July 1, and in a few weeks the supply on hand will have been disposed of and the plant cleaned up. It has cost the new company $3.94 per ton to treat ore at that smelter, whereas the average cost of smelting ores at the Washoe smelter is $2.15 per ton. Hereafter all Coalition ores will be smelted at Anaconda, and it is expected that that company secured from the Washoe a rate that must be better than the cost of treating ores at the old Heinze smelter. The North Butte is paying a rate at the Washoe that last year averaged $4.84 per ton. The capacity of the Washoe smelter is being increased. Its present capacity is 10,000 tons of ore per day.

IN brick-laying and masonry, the over-lapping of bricks or stones in one course over those below is termed 'bond.' It is done to prevent vertical joints being carried up in the work, which joints, being of mortar, are weaker than the stone or brick. In common brick walls each sixth or seventh course of brick called 'headers' is laid cross-wise of the wall, while the other bricks laid lengthways are termed 'stretchers.'

THE material used for suction and discharge pipes for pumps is almost always iron or steel. While cast-iron is used for water-works purposes, and is less subject to corrosion than iron or steel, still pipes of such material are heavy and the sections hard to handle. Wrought iron or steel costs less, gives greater security under the shock of the water (water hammer) and is easily cut and fitted to place in the mine. It is a fault of pipe manufacturers to recommend pipe of insufficient thickness. This is due to the strong competition and to the fact that mining men do not themselves calculate the strain of the water on the pipe. The bursting of a pipe-column may easily cause great damage, or even loss of life.

MANY water-power plants, otherwise well designed, have been rendered inefficient by bringing the water to the wheel in pipes too small for the quantity they had to carry. If much water has to pass through a small pipe it must necessarily flow fast. Even for large-sized pipes a higher speed than 6 ft. per sec. cannot be recommended. High speeds of flow involve a loss of working head. For example, a pipe, 1000 ft. long with 100 ft. fall, is 7 in. diam. and the quantity of water flowing through it 100 cu. ft. per min. the speed is 6 ft. per sec. Were the water standing in the pipe, the pressure at the lower end would be 43 lb. per sq. in. but when 100 cu. ft. per min. is flowing through it, the pressure drops to 33½ lb. per sq. in. equal to a loss of 22%. By using a 9 in. pipe this loss is reduced to 7 per cent.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

George R. Welborn, president of the Ellwell Gold Mining Co., has left Tombstone for the company's property in the Huachuca mountains, in the southwest corner of the county, to begin operations. A force of men has already arrived at the camp and has begun work. Welborn states that a shaft will be sunk 200 ft. to the vein. Machinery and supplies have arrived at Hereford and are being transported to the mine. It is the intention of the management to equip the mill and mines with electric power and to do away with the use of gasoline for lighting and power.——George Bernard, foreman of the Gold Mountain property, has men timbering 400 ft. of the 600-ft. adit recently run in the property. Bernard states that work will be resumed and continued until the ground is thoroughly tested. He reports the indications good.

GRAHAM COUNTY.

It is generally reported from Clifton and Morenci mining districts that a strike of large proportions is anticipated by the mining companies operating there. In Morenci the signs of trouble are particularly apparent, the Mexican laborers and miners of the camp having held secret meetings for some time past and conducting themselves in a sullen manner which usually foretells trouble. They have, all of them, kept their accounts closely traded up at the company's store so that when pay-day arrives there will be only small amounts to their credit. Trouble is feared only with the Mexicans, the Americans in the camp having expressed themselves as well satisfied with the treatment they are receiving at the hands of the company. Four hundred Mexican miners are in the employ of the Detroit Copper Co., at Morenci, and as many more in the mines of the Arizona Copper Co., at Clifton, and the properties at Coronado and Metcalf. Several days ago an eight-hour day was granted the miners of the section where the trouble is feared, with a reduction in wages of 25c. per day. The working day had previously been 12 hr. Since then secret meetings of the miners have been held several nights every week. The situation is similar to the one preceding the trouble in that camp three years ago when it was necessary to call out the militia. The rangers have been advised of the situation and Captain Rynning is now at Morenci with a number of his men. The sheriff of Graham county is authority for the statement that the most serious trouble was anticipated on the first of the month. It is also reported from Globe that trouble in that camp will likely result at any time, following a clash between the colored miners and the Slavonians employed there.

CALIFORNIA.

AMADOR COUNTY.

A young Italian named Chiesa was killed in the Kennedy vertical shaft one night last week, by being caught in the timbers while being hoisted with his companions to the surface. His crushed body after release from the rapidly rising skip fell nearly 3,000 ft. to the sump.——Negotiations are in progress for the sale of the Defender mine, near Volcano, one of the most successful mines of Pioneer district.

Complaint is being made of the scarcity of skilled miners in Amador county. It is claimed that 100 more miners could be given employment in the mines here, and that the men are not to be had. First-class miners get from $3 to $3.50 per day. There is no scarcity of common labor such as shovelers. It is hand-drillers, machine-men, timbermen and chuck-tenders that are needed. One reason assigned for this scarcity is that many men went to San Francisco, attracted by the $4 a day offered for hod-carriers and helpers. The Central Eureka, South Eureka, Keystone, Wildman, Kennedy and others, could employ a number of good miners if they were obtainable.

The Burlington shaft, on the south side of Sutter Creek, near the Baliol property, is down 325 ft., and cross-cutting has begun at the 300-ft. level, to cut parallel veins. Frank Bernardis is superintendent.

BUTTE COUNTY.

W. Howard has struck rich ore in the adit being run on the Young America claim near French Corral, on the Yuba. Stringers containing free gold are being encountered, and every indication points to a vein a short distance ahead. The property consists of seven claims.

CALAVERAS COUNTY.

Wayne Darlington, general manager, and G. B. Easley of the Bagdad-Chase Gold Mining Co., have recently been at Copperopolis and Hodson examining mining properties in the vicinity of Hodson, in Salt Spring valley.——The Union copper mine at Copperopolis is now equipped with hoist, concentrator and smelter. Fifty tons of matte are produced daily carrying 50% copper.——Hodson near the Royal Consolidated mine is almost deserted and the property is closed down and in the hands of a receiver.——The Mountain King, an extension of the Royal Consolidated, is dropping 10 stamps.——The Alto mine, near Stanislaus river, below O'Byrne's ferry, is running. The 40-stamp mill crushed last year 75,000 tons of ore.

NEVADA COUNTY.

A strike of good ore is reported made in a winze sunk on the 300-ft. level of the Conklin mine near Grass Valley. The vein is small but rich.

Judge Nilon, in the superior court in this county, has decided, in the case of Joseph E. Osselin, *vs.* Oliver et al., that the land grant to the railroads may include mineral lands. The court denied the motion of defendants for nonsuit, which had been interposed when the plaintiff rested his case, the court ruling that the plaintiff had a prima facie case in connecting his title with the patent issued by the Government to the Central Pacific railroad. When the defendants offered to prove the character of the land in dispute by attempting to introduce evidence tending to show it to be mineral the question arose as to whether the patent could be attacked in such an action as this, or in any other manner than by a direct proceeding in the name of the Government brought for the purpose of cancelling the patent, on the ground of fraud or mistake occurring in obtaining the patent. Many cases were cited to the effect that the Land Department was the exclusive judge of the character of the land up to the time of the issuance of the patent, and that its judgment in that respect could not be reviewed or questioned in any proceeding other than one instituted for that purpose solely. The cases read to the court further stated that the stability of title is a factor in the prosperity of a community not to be overlooked, and that ample opportunity is afforded a mineral claimant for filing a protest during the pendency of patent proceedings. Following the decisions presented the court rendered judgment from the bench in favor of the plaintiff quieting his title to the entire tract of land in dispute, including the Moonlight quartz mining claim, as far as it conflicts with the Osselin ranch at Gold Flat, adjoining the Chicago mine. It is stated that the defendants will appeal.——With its mine flooded and both dumps idle the Union Hill Co. is now planning to install a complete electric pumping system which will handle all the inflow that will, in all probability, ever be encountered. It was only recently that the steam pumps broke down. They were repaired but have again gone out of business and the shaft is filling up. The company purchased the property only a short time ago. A large vein was struck recently. Until a new pumping plant can be put in, work will be practically suspended at the Morydena, a new mine being opened up at Kentucky ridge five miles northwest of Grass Valley. The shaft is down 46 ft. sinking on a vein two feet wide which carries fine-looking ore. Free gold is frequently seen. The sulphurets are rich. Little has ever been done in the Kentucky ridge district in developing quartz veins. The management is preparing to crush at a local mill.——A five-stamp mill and a rock-breaker are being put in at the Republic mine in Graniteville district, near Nevada City. Room will be made in the mill for an additional five stamps, which will be added later. Two long adits are run. On the dump is sufficient ore to keep the mill running for several months without drawing on the mine. Heretofore the owners of the Republic have been milling their ore at a neighboring plant. This is another example of a mine which once paid well, was closed, lay idle for many years, finally reopened and after some development again became a good producer.

The Red Cross mine, at Omega, is to be re-opened. J. A. Brent of San Francisco, who formerly operated the property, has taken a bond on it from the Western Exploration Co. The mine is equipped with a 20-stamp mill, compressor and machine-drills, besides numerous buildings. For three years the mine has lain idle; now Mr. Brent proposes to drive the adit ahead to reach a large orebody.——The Ocean Star mine at Ormonde, owned by M. D. Cooley and recently bonded to A. Maltman et al., is being opened up. Things are being put in shape to drive the adit ahead and open the mine in a systematic manner.——With both pumps out of commission and the mine flooded, the Union Hill will install an electric pumping plant to replace the present system. The mine undoubtedly gathers much water from the creek near by, and recently the pumps broke down, but it was thought they could be repaired sufficiently to enable operations to proceed, which expectation was not realized. Frank Enzensperger, superintendent, has given up hope of again doing anything with the old pumping plant, and states that the mine will be equipped with the latest in the electrical pumping line. The Union Hill has a large vein and some high-grade ore has been taken from the mine recently. The company of lessees who operated for nearly a year prior to the present company taking hold, took out high-grade milling ore almost from the start.

PLACER COUNTY.

At the Three Stars mine, seven miles northwest of Auburn, 30 men are employed, and it is reported good ore has been found.

SAN BERNARDINO COUNTY.

The people who have been prospecting the gravel of Klinefelter wash, 20 miles northwest of Needles, where placer gold has been found, have quit work and shipped their engines and pump. They found such a flow of water that they were unable to get to bedrock, although they found gold in the clay strata above bedrock. While it is believed that there is gold on bedrock in paying quantity, the efforts which have been made to demonstrate it have all failed. The development of water in the wash should be a valuable asset to the owners of the mines, as water in that region is both scarce and necessary.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Dives-Pelican Co. is installing a Crane washer at the head of the mill to handle the material as it comes from the breaker. The ore after going through the washer goes onto a picking belt where it is sorted, and from there to the Samson crusher and thence to bins discharging to rolls, and on down through the mill over the tables. The ore makes 50% fines and it is the intention to cut out 9½ tons waste from every thirteen tons handled of the fines. It is believed this method will cheapen the cost of treatment in the mill and leave the material in better shape for jigs and Wilfleys. It is estimated that the cost of handling all of the material through the mill at present is 65c. per ton which the washer will reduce to 12c. per ton.

Silver Plume, June 27.

A strike is reported in the Piltz group in East Argentine district, which is being worked under lease and bond by Clark and Van Hoven. A vein of lead ore 12 in. wide has been encountered in the main level which gives good returns in silver and lead from $8 to $10 gold. The Argentine railroad is convenient to this property.——The Two American Sisters Mining, Milling, Power & Electric Co. has been organized to construct a water and electric power plant on Clear creek below Georgetown, and to operate the American Sisters mine on Silver creek. J. J. White, of Georgetown is at the head of this enterprise. The company has secured a suitable power and mill-site along the creek and the race-track will be converted into a lake for water storage.——A 500-h.p. electric power-generating plant will be erected on the Hewett ranch, and power and light lines will be extended to the mine, where a concentrating mill will be built and a large compressor installed The property has a record of producing about $2,000,000.

SUMMIT COUNTY.

(Special Correspondence).—The main cross-cut adit now being advanced in from French gulch through the Mono Co.'s ground to cut the Abundance vein is making rapid progress. This adit will intersect several known veins, among them the Old Union, which is being worked by the Abundance Co., and which is furnishing the bulk of the ore now being tested by its 150-ton concentrating mill. All shaft work at the Abundance property is, for the time being, suspended until the adit is driven far enough to make connections. The diamond-drill plant operated by the same company in Yuba Dam flats has already pierced several orebodies.—— The Pennsylvania mine, at Argentine, is working a full force in the mine, making regular shipments of high-grade smelting silver-lead ore. The 40-ton mill is running full time on the lower grade ore, turning out a high-grade concentrate.——The Silver King mine, on Nigger hill, has been the scene of an important strike. In starting a new shaft a vein, hitherto unknown, was cut seven feet from the surface. The ore is mostly lead carbonate and iron oxide which gives by assay 0.5 oz. gold, 35 to 40% lead and several ounces silver per ton. The vein is from 16 to 20 in. wide. This is the sixth vein opened up by the lessees in this property within the last 18 months, and they have made large shipments of smelting ore which contains $42 per ton net.——A rich body of high-grade ore has been cut in the main shaft of the London mine in Hoosier gulch. This was intersected at a depth of 200 ft. in the main vertical shaft which is being sunk to the lower limestone formation. M. M. Howe, of Breckenridge, is manager of the company.——The Summit Banner placer mine is working with full force under the management of Lemuel Kingsbury. They are washing about 4,000 yd. of ground per day which is yielding, on an average, 15 to 20c. per yd. During hydraulicking operations lately quartzite boulders carrying visible gold have been unearthed indicating that these placers are not far from the veins which produced the gold. Assays of these boulders have given returns up to $285 per ton.——The Banner is working and this season's operations promise to be profitable.——The management of the Buffalo Placer Mining Co., at Dillon, is also in the hands of Mr. Kingsbury, who is getting the property into shape for work similar to that at the Banner. A load of riffles went up to the property yesterday.——The Atlantic Gold Mining Co., operating a property on North Star mountain, has taken a long lease on the Sovereign mill, at Montgomery, and is getting it into shape for treatment of free-gold ore. The mill is well equipped for amalgamation, concentration and cyanidation, and thorough tests will be made as to the best method of treatment for the ore. Frank Lawrence is in charge of the works.

Breckenridge, June 28.

TELLER COUNTY.

G. H. Holman, C. H. Noyes and Edgar McDaniels, operating the Comet claim of the Isabella under lease, have cut ore in the first level from the Comet main shaft, at a depth of 50 ft., and will put in machinery. They expect to be hoisting within two weeks. In the meantime the orebody will be sought from a similar depth in the incline shaft, which is 50 ft. northwest of the main workings. —— J. B. Cunningham, of Victor, is shipping regularly two cars of two ounce ore from his lease on the 300-ft. level of Stratton's Independence mine. —— F. S. Prettyman, manager of the Ironclad mill of the Cripple Creek Homestake Mining & Reduction Co., has been appointed manager of the large mill of the company and expects to begin operations there by the middle of July. The mill is equipped with a plant that cost $130,000, and has a capacity of 1,000 tons of oxidized ore per day. Prettyman believes that he has discovered a body of ore that will furnish this quantity in the Homestake Co.'s Ironclad and Magna Charta claims.

J. D. Spencer of Clyde brought to Cripple Creek recently half a ton of fine-looking ore. The discovery was made by Mr. Spencer after eight years of prospecting near Clyde. Notwithstanding disappointments he continued to drive his adit, and now has a seven-foot vein. All ground in this vicinity has been staked at one time or another, although several of the claims have been abandoned. A rush to the district is now anticipated.

IDAHO.

BLAINE COUNTY.

The lowest adit in Nay Aug ground near Hailey has found the ore anticipated, the heading having recently cut into a solid foot of galena. Beside this there are several inches of concentrating ore carrying zinc. There was ore for 350 ft. in the adit-level worked last year and the strike is believed to be a continuation of it in depth.——The Dollarhide mill has been shut down for a few days to put in a settling tank and to enable the teams to catch up with the output. Although the mill is in operation only 10 hr. per day, it makes concentrate faster than teams can be secured to haul it to the railroad. There are four carloads at the mill, and as there is room for more, it necessitates re-handling. An effort is being made to get teams in order that the mill may be kept going 24 hr. per day.

SHOSHONE COUNTY.

The Great Western will soon be doing work with machine-drills. The compressor has been set up and the pipe-line from the compressor to the receiver, 560 ft. in the adit, is now being connected. The poles for the power-line are being put up and it is expected the wires will be strung and ready for use inside a week. The parallel vein, cut some time ago, continues to show galena and copper ore.——Richard Daxon, manager of the Tarbox mine near Wardner, reports the winze completed, the station on the 600-ft. level finished and the cross-cut to the vein on that level well under way, 15 ft. having been driven. It is estimated the vein will be cut 80 ft. from the shaft on this level. The showing on the 550 ft. was so good that the management is putting in a sawmill preliminary to building a 200-ton concentrator.——An option has been taken on the Cooney group situated east of the Poorman, near Burke, by John A. Ryan. The price agreed upon is $160,000, and if the bond is executed 10% will be paid down. Mark Cooney is the largest owner, the other owners being John Kelly, Peter D. Lambert and Frank Murphy. The group consists of 12 claims, four of which have been patented.——Work has been started on the Little Butte group, which adjoins the Great Western mine on upper Canyon creek. It is owned by Mr. Rossi of Wallace and M. J. Farrell and Mack Cyr of Burke.——The Inter-State Co., operating in the Sunset country, proposes to run an adit from a point as near Nine Mile as practicable. Approximately 3,000 ft. of driving will be required to get under the best ore in the upper workings.——In two weeks more the Frisco mine at Gem will be working full blast. At that time the company will commence sinking a 200-ft. shaft from its 2,000-ft. level. On February 1 of this year the great undertaking of unwatering the mine was commenced, draining being done with two 1,000-gal. bailing-tanks. The company installed two large steam-pumps, but they cannot be worked profitably in connection with the bailing-tanks, as the steam is condensed by the water before it reaches the pumps, and the tanks accomplish more than the pumps would.——A rich strike has been made in the Colwyn mine in the Sunset peak district of the Cœur d'Alene. The mine is owned and operated by the Idora Mining Co. A stringer was discovered at the 200-ft. level and this, on being followed, widened until the entire face was in ore, which is galena assaying 50% lead and 25 to 30 oz. silver. Lead carbonate was also discovered in the foot-wall of the vein by a cross-cut. The company will build a concentrator to treat the low-grade ore.

MICHIGAN.

HOUGHTON COUNTY.

Announcement has been made of a voluntary five per cent increase in wages of all employees of Wolverine, Mohawk, Tamarack, North Kearsarge, Osceola, South Kearsarge and Ahmeek mines, becoming effective July 1. Nearly 6,000 men are benefited by this increase.

MONTANA.

SILVER BOW COUNTY.

Announcement is made by the company operating the properties controlled by the Butte Coalition Co., that the Montana Ore Purchasing Co.'s smelter will be closed down early in July and the ore from the mines now treated there will be sent to the Washoe smelter at Anaconda. The Mon-

tana Ore Purchasing Co.'s smelter, in conjunction with the Basin concentrator, operated by F. A. Heinze under lease, treats about 1,200 tons per day and employs 300 men. The ore being treated at the Montana Ore Purchasing Co.'s works is from the properties acquired from Heinze by the Butte Coalition Company.

NEVADA.

ESMERALDA COUNTY.

On the Detch-Brewer lease of the Goldfield-Daisy Mining Syndicate, Detch and Brewer have made a strike in which $4,000 worth of ore has been taken out. Their shaft is 150 ft. deep. The new strike was made in a 220-ft. cross-cut from the 80-ft. level. The vein is four feet wide, with a 14-in. streak running through the centre in which the best ore occurs. Detch and Brewer only recently secured two more blocks of adjoining ground, giving them 400 ft. in length, in the centre of which is the shaft where the find was made. Their lease runs 18 months. This property is a mile north of Diamondfield.——On Sunday night, in the drift on the 150-ft. level, running south, on the Jumbo a seam of rich ore was found. A small pan of this ore gave nearly a teaspoonful of gold.——The Nevada-Goldfield Reduction Co. will install a Butters filter for the treatment of its slime at Goldfield. This will be similar to the plant at the Combination mill. Mark R. Lamb designed the plant. Most of the machinery for the sampler and for the completion of the mill is here or on the way, and it is expected that the mill will be in a position to buy ore within a few weeks.

LINCOLN COUNTY.

(Special Correspondence).—A short time ago attention was called to the interest being manifested in the Searchlight district by men prominent in mining affairs and by the outside public in general. This interest appears to be enduring. Contrary to the condition which usually prevails in the desert mining camp during the summer season, merchants are active and report no falling off in trade. The freight wagons are as busy hauling supplies as they were in winter. Mr. White, formerly president of the El Paso bank of Colorado Springs, and Mr. Wilson, a mining man, have bought the Le Roy mine and will install a new 25-h.p. hoist and a Cornish pump. They will straighten, enlarge, and timber the shaft.——The Searchlight Mining & Milling Co. has put in a cyanide plant of 100-ton capacity to be used in treating the dump tailing. A large pump, 60-h.p. gasoline engine, and a full electrical plant have also been ordered. This addition to its equipment will enable the company to operate on a much larger scale. Sinking in the main shaft and exploration of other known veins will begin with the installation of the new machinery. J. W. Short, a prospector, has just brought in some samples of ore taken from his claim at Lewis' hole, 12 miles southwest of here, which assay $5,000 per ton. Short returned to the scene of his strike accompanied, and followed, by an excited crowd of prospectors from Searchlight, and a stampede of goldseekers is now heading for the new bonanza. The formation is described as being gneiss and rhyolite.——Francis Ormond has deeded his Searchlight holdings to W. W. Hurt of Los Angeles. The Ormond interests include the Ormond addition and the Daylight group of mining claims, comprising 100 acres north of town.——At El Dorado canyon the Techaticup Mining Co. will sink a new double-compartment shaft and install a hoist and other machinery. In the 670-ft. main shaft the last 50 ft. of the vein was almost flat, but it has now assumed a pitch of 75 degrees and averages $100 per ton in gold and copper.——The El Dorado Canyon Mining & Milling Co. is driving an adit into the hillside on the Buster Brown claim which will give several hundred feet of stoping ground.

Searchlight, July 2.

NYE COUNTY.

It is reported that Donald Gillies has superseded John McKane as the representative of Charles M. Schwab in Nevada. Mr. Gillies has been associated with the Schwab properties for some time. Mr. McKane has resigned from all of the Schwab properties in Nevada in which he was in any way connected. It is said that McKane offered his holdings to Schwab, who declined them, preferring to have the market absorb them, believing that he could obtain the stock for less in this manner than in any other way. As a result, apparently, of this move, stock in the Tonopah Extension mine at Tonopah, dropped in the Wall Street market on Thursday, the 5th inst., from $15 to $4.50—a depreciation in stock value of $10,500,000.

A press dispatch from Tonopah says: While union men are saying little about the organization at this point of the Tonopah Mine Operators' Association, the advertised purpose of which is to promote harmony and a universal wage scale between the companies and their employees, it is known that the miners are quietly strengthening their organization, anticipating a campaign of gradual resistance upon the part of the mine owners. August 1 it is intended by the mine owners to put into effect a universal wage scale in the camp. There will probably be no friction about the matter this time, but the close union of the employers, the most important of whom are now non-residents, indicates that the union will not be dealt with as leniently as before. Outside of Nevada it is not generally known that a large majority of the miners in the southern country are Colorado men, Western Federation members, who were driven out of Colorado. Their feeling against the Colorado operators is intense and they have bound up southern Nevada in the strongest unions ever formed in any State. So powerful they are that when Colorado operators who assisted in their expulsion attempted to enter southern Nevada they were promptly driven from the districts. Both political parties, for two years, have dreaded an outbreak of hostilities between operators and employees. The State has no militia, and as long as the union influence can prevent it there will be no laws friendly to militarism enacted in Nevada. On every occasion upon which there has been friction the political leaders in the State have done all in their power to establish harmony. They especially hope, upon the eve of the campaign, that there will be no trouble.——A new strike has been made in the main adit of the Gibraltar at Rhyolite. The vein is several feet in width, with a rich streak in the middle. The ore is being sacked for shipment.

NEW MEXICO.

GRANT COUNTY.

Theodore W. Carter, of Silver City, has sold his five mines, constituting the Monarch group, near White Signal, to Harry L. Martin, of Los Angeles, California. The mines are in the Burro mountains.

OREGON.

BAKER COUNTY.

The Golconda mine, near Sumpter, is again in operation, and 20 stamps are crushing its ore. In the mine three payshoots have been found and are being developed.

SOUTH DAKOTA.

CUSTER COUNTY.

At a recent meeting of the Black Hills Mining Men's Association, C. W. Robbins, of Custer, described the ore of Custer county as so complex as to resist treatment by any known process. The most of these refractory ores are auriferous and are combined with arsenic.

LAWRENCE COUNTY.

The new cross-cut at the Globe mine, near Lead, intended to develop veins found last winter, has reached the 200-ft. mark. According to the calculations of F. E. Ickes, manager, it will be necessary to drive 400 ft. to tap these orebodies. Two shifts are employed, and machine-drills are used. Samples recently taken averaged $6.50 per ton gold. The ore is in phonolite, carrying pyrite and fluorite.——The plans of the Mogul Co. at Pluma, for the construction and equipment of its new mill, embody the latest in cyanide practice. The plant is being designed by J. V. N. Dorr, who also has supervision of construction, and will be in charge of the plant after its completion. The results of the operations of the mill at Terry which was destroyed by fire were taken into consideration and exhaustive tests made upon the ore from the different mines of the company. The ore coming from the mines in cars by the Burlington railroad will be dumped into large storage-bins at the top of the mill, and drawn from them to two No. 5 Gates crushers that will break the material to pass a 2½-in. ring. Thence it will go to

four sets of 14 by 36-in. rolls, and from these to four six-foot Chilean mills which will discharge into Dorr classifiers—a machine for the separation of sand and slime invented and perfected by the superintendent—and thence to the sand and slime departments. In the sand department the leaching will be accomplished in eight vats 25 by 10 ft. The higher grade sand will be reduced to slime in a tube-mill, and will go thence to the slime department. The slime will probably be handled by the Moore process, although this point has not been definitely decided. Precipitation by zinc-shaving will be used throughout the plant, which will have a capacity of 300 tons per day.

The Homestake slime plant at Deadwood is nearing completion. A steam road-roller has been used in the filter-press room to make a solid gravel foundation for the concrete floor that is to be laid in this department, which is 65 by 270 ft. and will contain 24 presses, having a capacity of 1,400 tons daily.

UTAH.

JUAB COUNTY.

The Little Edgar Mining Co. has filed articles of incorporation. The company is organized to do a general mining business, with Eureka as the principal office. The officers and directors are John T. O'Brien, president; C. Gustaldi, vice president; J. A. O'Brien, secretary and managing director; Jere Driscoll, treasurer; and Jesse O'Brien. The mines are in Tintic district.——It is reported that the South Eureka and other adjoining property will form the basis of a company to be incorporated for the purpose of developing this ground, which adjoins the Centennial-Eureka on the south. ——Robert Brown of the Centennial-Eureka mine, Herbert Hopes and B. N. C. Stott recently inspected the Prairie Bell Co.'s property, in which they are interested. Work is still being done in the adit under the direction of Joseph Burrows.——George W. Riter, of the Eureka Hill Co., says the lessees now at work in the mine are nearly all taking out a good grade of ore.

SALT LAKE COUNTY.

There is much satisfaction in Bingham district over the announcement that the local miners' union, a branch of the Western Federation of Miners, at a recent meeting, voted down the proposition of a walk-out of all labor in the camp. It is believed that this action will meet with general approval, and that the miners will profit in the long run as a result of this course. It has been learned from Salt Lake that the mine-owners had decided to stand together as a man and not grant a single concession to the union. It is a fact that they had made preparations to shut down all properties rather than yield to the demands of the miners. The latter are aware of this and contemplate another trial by voting on the proposed strike once more, the next time on August 3.

SEVIER COUNTY.

During the past week a strike of a big body of lead ore a few miles south of Monroe has been reported. In driving an adit to develop a water supply for the Edward Nazer farm the workmen encountered a vein eight feet wide, and some of it is almost solid galena. Men are still at work and have gone several feet into it; it looks like a permanent vein.

SUMMIT COUNTY,

The Jupiter mine, in Thayne's canyon, seems in a fair way to become a big mine. Ore of high grade is being mined and several tons are in the bins awaiting hauling to the samplers. Ore has been opened up in several places. The main question is to get the mine in shape for regular production. The management has bought the machinery from the old Loring mill, formerly in Woodside canyon below the King, and it will be removed to the Jupiter.——Boilers for the new steam-plant at the Nelson property in the Elkhorn district have been taken over with the remainder of the equipment to be installed.——Work at the Uintah-Treasure Hill property is going on steadily, and the ground is opening up encouragingly.

TOOELE COUNTY.

E. D. Carmon, superintendent of the Polar Star mine in the Clifton district, reports conditions prosperous in that portion of the Deep Creek district. He says a new adit is to be driven on the Polar Star which will tap the orebodies developed in the shaft.——Good reports are coming from the Gold Hill mine, which is being developed under the direction of Duncan McVichie.

WASHINGTON.

OKANOGAN COUNTY.

(Special Correspondence).—Munro Harman manager of the Ruby mine, at the base of Mt. Chopaca, reports that he is taking out rich ore and will ship on completion of the Vancouver, Victoria & Eastern Railway.—J. J. Bennett, who bonded the Kimberly group several months ago, has organized a company in Ohio and calculates to begin operations in two weeks.

Loomis, June 30.

SNOHOMISH COUNTY.

The Supreme Court of New York State has handed down a decision in a case involving the mining property known as the Pride of the Mountains, situated in Monte Cristo district, which has been before the courts for 14 years. The decision finds for the plaintiffs, in the sum of $175,000. The Pride of the Mountains mine was sold by the late Hiram G. Bond, Wilmans brothers and Edward Blewett, to Colgate Hoyt and Charles L. Colby, agents of John D. Rockefeller, and the suit was brought against Colby as such agent. The consideration was to be $350,000, of which $175,000 was to be paid in cash and the balance was to be paid out of the proceeds of the mine or by the purchasers; in the event of the $175,000 remaining unpaid after a certain period, the property was to revert to the original owners, plaintiffs in the suit. More than 150,000 tons of ore, which yielded returns of from $10 to $20 per ton, in gold, silver, copper and arsenic, were taken out.

CANADA.

BRITISH COLUMBIA.

In the Slocan, lessees of the Queen-Dominion will ship another car of ore. Boulders of ore weighing over a ton are being sluiced out at the Wonderful mine.——Ore-bins at the Bosun Landing are completed, and the construction of the tram line has commenced. —— Two cars of ore are ready for shipment from the Index mine, up the south fork of Kaslo creek. A fine body of ore was struck a few days since. —— Recent shipments were 390 tons of zinc ore from the Ruth to the Kootenay Ore Co. at Kaslo, and 40 of zinc ore from the American Boy to the Prime Western Co. of Gas, Kansas.—— Several men are at the Monitor loading ore from the dumps for shipment to Rosebery. Ninety-seven tons went down last week and steady shipments are being made. —— James Cronin, manager of the St. Eugene, has been making an examination of the Eureka and has put several men to work.——A rich strike is reported from the McAllister group up the north fork of Carpenter creek. The ore assays over 1,000 oz., mostly wire silver embedded in quartz. Great care has to be taken in handling the rich pay-streak, as it crumbles easily.

It is announced by A. B. W. Hodges, superintendent of the Granby Consolidated Co., that from this time forward work will be steadily prosecuted on the new main shaft at the Granby mines, which, it is estimated, will cost $100,000. It will be known as the Victoria shaft. For some months two diamond-drills have been at work on the surface and underground in the Granby mines, and the situation selected is near the compressor building, where both the C. P. R. and Great Northern can readily run spurs to the crusher and ore-bins. Surface work has been started; when completed, the mine will have facilities for taking out from 4,000 to 5,000 tons of ore per day.

MEXICO.

JALISCO.

One of the most important mining deals recently made at Guadalajara is the transfer of El Favor mines in the Hostotipaquilla district of Jalisco to Makeever Bros. of New York. The deal involves the investment of $250,000 gold. An American company, to be known as the El Favor Mining Co., will be organized at once with a capital of $3,500,000, to take over and work the mines.

The mines were secured by Makeever Bros. from W. R.

Ramsdell and associates, and Carlos Romero. Mr. Ramsdell and associates purchased El Favor mines proper about five years ago, and they will now become interested in the new company. For several years Mr. Romero has held continuations of El Favor veins. The mineral land included in the transfer amounts to 152 pertenencias, or 376 acres. El Favor mines are the oldest in this part of Mexico, and the old workings are very extensive. They adjoin the Tamara y Anexas of Carlos Romero and the Solomon of Martinez Bros., both bonanza properties. Years before the Spaniards appeared the mines were opened by the Cora Indians, and when the conquistadores invaded that section of the country and began the confiscation of Indian mines, the Coras fought them to retain possession of their property. The fighting continued for many years and the Coras were always successful, the mines never passing into the hands of the Spaniards even for a limited time. Up to the time of the purchase by Mr. Ramsdell and his associates the mines were owned by Indians and Mexicans, and only primitive mining was done. Only rich ore could be handled, and there is a dump of 30,000 tons from the old workings that averages $24 per ton. The old workings consist of a main adit and about 600 ft. of drifts, stopes, and cross-cuts.

GUANAJUATO.

The sale of the San Cayetano mines, six miles north of the city of Guanajuato, has been practically concluded. The purchasers are English parties, and the deal was made through the Mineral Development Co. of New York, which is already interested in the Guanajuato district. A partial payment has been made, and it is stated that the final payment will be made soon. It is understood that the transfer involves more than $100,000. The San Cayetano mines have been owned for many years by the United Mexican Mines Association, Ltd., of London. With the conclusion of the San Cayetano sale, this corporation will go out of existence. It was originally organized in 1814, and became extensively interested in mines in different sections of Mexico. With the exception of the San Cayetano, all its holdings were disposed of several years ago.

ZACATECAS.

L. Maurice Cockerell, for the last two years general manager of the Mezquital Gold Mines, Ltd., the English company operating the gold mines and stamp-mill at Mezquital del Oro, has resigned. He will leave the mines as soon as his successor, a mining man from Australia, reaches there. Mr. Cockerell will go to England in August, and on his return to Mexico will devote his attention to other mining interests. The work of unwatering the lower levels of the Mezquital mines, which was started some time ago, will be completed in about two weeks. Production will be then resumed, and the 50-stamp mill, which was shut down pending the unwatering, will be again placed in operation. A Cameron pump with a capacity of 250 gal. per min. is being used to unwater the lower levels, which are about 750 ft. below the surface.

AN English imperial gallon weighs 10 lb., but the standard gallon used in the United States weighs but 8⅓ lb. or 7½ gal. per cu. ft. This works out to 240 gal. per ton of 2,000 pounds.

IF we assume the weight of brick-work to be 120 lb. per cu. ft. and that it will begin to crush under 700 lb. per sq. in., then a brick-wall of uniform thickness would have to be 840 ft. high before the bottom courses would commence to crush from the weight of the brick-work above. Average sandstones, weighing 145 lb. per cu. ft., would need a column nearly 6000 ft. high to crush the bottom stones.

PASSENGER platform-elevators in buildings should be designed for 80 lb. per sq. ft. of platform area or 150 lb. per passenger. Generally the local ordinances limit the car speed, as in New York City, to a maximum of 400 ft. per min. for cars which stop at every floor, and to 500 ft. per min. for express cars, those which go to two-thirds of their travel without stop. Four hundred feet per minute is about as high a speed as the average human system can stand without unpleasant sensation and is ample for the best schedules.

Personals.

O. H. FAIRCHILD is at Denver.

J. J. MAY has returned from New York to Denver.

A. B. FRENZEL has returned to Denver from Salt Lake.

J. H. ROBESON, of Denver, is in Arizona on professional business.

A. F. HEWITT has returned to Denver from Quartzsite, Arizona.

L. H. L. HUDDART has arrived in London from Southern Nigeria.

EUGENE BRADEN has returned from a short trip to Helena, Montana.

W. L. MCLAUGHLIN has returned to Deadwood from Pittsburg.

JOHN PENBERTHY is on a visit to Redruth, Cornwall, from Bolivia.

W. FAY BOERICKE is prospecting in the region near Fairview, Nevada.

RICHARD A. PARKER has returned to Denver from British Columbia.

WILLIAM H. WASHBURN has gone from Fairbanks to Nome, Alaska.

GEORGE A. SCHROTER was married on July 1 at Brooklyn, New York.

D. M. RIORDAN is at the Bully Hill mine, in Shasta county, California.

P. G. LIDNER has returned from examining mineral lands in Santo Domingo.

W. B. PATRICK, of Denver, is visiting San Francisco, on his way to Nevada.

E. F. WETTLER, of St. Louis, is registered at the Baltimore hotel, San Francisco.

J. M. FOUSE has come from Denver to study dredging methods in California.

FRED B. REECE is with the Bunker Hill & Sullivan Mining Co., at Kellogg, Idaho.

FRANK COGILL, Secretary for Mines in the Gold Coast Colony, is visiting England.

J. V. N. DORR is supervising the construction of the Mogul mill, at Pluma, South Dakota.

ALFRED JAMES arrived on July 4 at Vancouver from Australia. He is now at Berkeley.

FRANCIS L. BOSQUI leaves on July 12, to make a metallurgical investigation at Denver.

JOHN ARTHUR has been appointed manager of the California mine near Sumpter, Oregon.

JOHN H. HUDSON, Jr., has his office now with W. R. Grace & Co., at Valparaiso, Chile.

W. C. OREM has returned to Salt Lake, from an inspection of mines in Mason Valley, Nevada.

HERBERT HAAS has gone to Torreon, Mexico, with the Compania Metallurgica de Torreon.

CHARLES MAGILL has resigned the management of the Guadalupe mine, at Inde, Durango.

M. M. HOWE, is manager of the London mine in Hoosier gulch, in Summit county, Colorado.

W. M. TURNER is superintendent of the Green Mountain Co.'s new mill at Silverton, Colorado.

H. A. SHIPMAN and R. J. GRANT have returned to Denver after an extended trip through Nevada.

CHAS. A. DEVLAN, of Boise, is investigating mines at Hailey in the Wood River country of Idaho.

EDWIN E. CHASE has returned to Denver from Mexico. He will proceed to Ely, Nevada, at once.

JAMES W. MALCOLMSON has returned to El Paso from an inspection at Tuxpan, in Jalisco, Mexico.

ERNEST LEVY is about to go to Australia from London, in the interest of the firm of Hill & Stewart.

E. F. STAPLES has been at Kelvin, Arizona, making examinations of lead, copper and tungsten mines.

J. CROWTHER, professor of metallurgy in the University of Adelaide, is on a visit to his home in England.

LEMUEL KINGSBURY is manager of the Summit and Buffalo placer mines, near Breckenridge, Colorado.

W. H. LINNEY is superintendent of the Nipissing Gold Mining Co., in Cobalt district, Ontario, Canada.

FOSTER HEWETT, of the Pittsburg Testing Laboratory, Ltd., was in Denver on his way home from Peru.

G. C. KLUG has resigned as general manager of the Boulder Perseverance mine at Kalgoorlie, West Australia.

A. L. WRIGHT, manager of the Bradley Engineering Co., of Spokane, was in Denver last week on his way East.

L. PITBLADO is in charge of the copper smelting operations at Capillitas, Province of Catamarca, in the Argentine.

JOHN E. PORTER has returned to Berkeley, from an inspection of his copper mine in Mariposa county, California.

R. S. BAVERSTOCK has returned to Los Angeles from an examination of scheelite deposits in Kern county, California.

G. C. HEWETT has returned to Colorado Springs from a professional trip to the new camp of Nuevo Leon in Mexico.

A. BOSCH is at Berlin and will proceed shortly to southwest Africa, as metallurgical director for the Otavi Mining Company.

LANCE C. GILLIAM, of the firm of Thompson & Gilliam, Los Angeles, is in Lower California, where he is examining a placer area.

F. LYNWOOD GARRISON has just returned to Philadelphia from a three months' professional trip in Missouri, Colorado, New Mexico and Arizona

DANIEL GUGGENHEIM, accompanied by engineers of the American Smelter Securities Corporation, leaves Vancouver on July 10 for an inspection in Alaska.

ARTHUR S. DWIGHT has resigned the general management of the Greene Consolidated Copper Co. He has left Cananea for Joliet, Illinois, on his way to New York, where he will take a well-earned rest.

HUGH R. VAN WAGENEN, of Denver, one of the graduates this year from the Colorado School of Mines, has taken the management of operations at the silver-lead mines in Castle Dome district, Arizona, and is actively engaged in reopening those once noted properties.

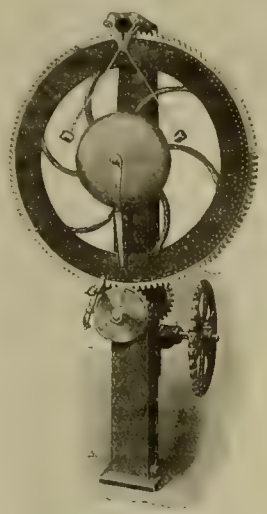
Obituary.

GEORGE H. ROBINSON died in New York on July 3, at the age of 53. As a mining engineer, he was one of the foremost members of the profession and leaves his mark on the development of Alaska, Colorado, Montana, and Utah. Born in Ohio, he possessed the ability and energy that have given distinction to so many men from that State. In the early days of Leadville he was agent for David Moffat and also for Tabor. Later he became manager of the celebrated Drumlummon mine, of the Montana Gold Mining Co., at Marysville, Montana. Then he moved to Salt Lake City and went into general practice, with marked success, being connected, in an advisory capacity, with several important mines. When F. Augustus Heinze got into his complex litigation at Butte, he needed a first-rate man to advise him in regard to the mining geology involved in his lawsuits and he engaged George Robinson, who exhibited great ability in several big cases. He severed active connection with Butte mining about three years ago and became interested in several important mining ventures, one of the most promising of which is the Britannia copper mine, on the coast of British Columbia. In many respects he illustrated the qualities, such as business insight and wide-awake energy, that have given the American mining engineer a leading place. Speaking generally, he was a particularly well informed and agreeable man, possessed of a distinct personality, which will be widely regretted throughout the West.

W. H. HARDY died at Whittier, California, on June 23. He was a pioneer in the Southwest, establishing an important trading post at Hardyville, on the Colorado river in Arizona in early days, and doing much to aid in the development of the mineral and other resources of that Territory.

Dial Alarm Indicator.

The accompanying illustration shows the Bolthoff Dial Alarm Indicator. The indicator is equipped with a bell which is struck by hammers at every point desired, giving a single stroke signal. The usual arrangement is to have the bell strike as each level is approached in both the upward and downward course of the cage. It may



Dial Alarm Indicator With Exhaust Control Attachment.

also be equipped with an exhaust-control attachment, as shown in the illustration, which serves as a safety stop, closing the exhaust-control and stopping the engine when the cage has reached the danger point. This dial alarm indicator may be attached to any kind of hoist and further particulars will be supplied by the manufacturers, The Hendrie & Bolthoff Co. of Denver.

ALUMINUM OUTPUT SMALL.—The increasing demand for aluminum and the increased price of copper, has created a shortage of aluminum. The fact that many parts of automobiles, motors, cables, etc., are now being made of aluminum, has served to increase the demand until it is fully 20% greater than the production. It is figured that the Hall patents on the manufacture of aluminum will soon expire and this will increase the output past the demand. There is not much danger of this. If the production is increased, the consumption will grow in proportion. Aluminum is an ideal metal for some lines of manufacture.—*American Manufacturer.*

Publications Received.

Bulletins No. 30 to 34 inclusive, of the Corps of Mining Engineers of Peru, Lima. These volumes are in Spanish and are well illustrated, describing the mineral resources of that southern Republic.

Dividends.

On July 5, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 106 of $180,000, making the total paid since January 1, 1906, $1,260,000, and total to date $6,786,000.

The Osceola Consolidated Mining Co. has declared a semi-annual dividend of $6 per share payable July 27. The previous dividend in December, 1905, was $4, and a year ago one of $2 was declared.

The directors of the Tamarack Mining Co. have declared a semi-annual dividend of $2. The last dividend was $3 per share.

Trade Treatises.

THE INGERSOLL-RAND CO. of New York have issued catalogue No. 383, describing and illustrating the Temple-Ingersoll electro-air rock-drill—an air-drill driven by electric power.

HARRON, RICKARD & MCCONE, Pacific Coast representatives of the Ingersoll-Rand Co., of New York, have issued a little pamphlet entitled Compressed-Air Pumping Systems. It describes the lifting of water and other liquids in pipes by means of compressed air applied in a new way.

DE LA VERGNE MACHINE CO., of New York, has issued a 48-page pamphlet describing various types of horizontal and vertical ammonia-compression refrigerating machines and equipment for ice plants, breweries, packing houses etc. The book is illustrated by many fine half-tones.

One of the original fan system heating and ventilating plants installed by the BUFFALO FORGE COMPANY in Buffalo was placed in the first works built by the Geo. N. Pierce Co., on Hanover St., a quarter of a century ago. The Pierce buildings have long been overcrowded, and since the fire, plans have been drawn and contracts let for a magnificent group of buildings on the Pan American site at Elmwood Ave. and the Belt Line, which in equipment and construction will be unexcelled in this country. The entire contract for heating and ventilating these buildings has been awarded to the Buffalo Forge Company.

ALLIS-CHALMERS CO. has issued Bulletin No. 1051, describing and illustrating its alternating-current generators of the belt-driven type.

Commercial Paragraphs.

THE BALAKLALA CON. COPPER CO. at Coram, in Shasta county, Cal., is building 3½ miles of Bleichert tramway furnished by the Trenton Iron Works Co., of Trenton, New Jersey.

THE INGERSOLL-RAND CO. of New York, through its Denver agents, Cary and Fielding, is supplying the Government with a 700-ft. compound steam and air compressor for use in the Gunnison tunnel, making three in all of this type of machine to be applied.

During the annual meeting of the American Institute of Mining Engineers which is to be held in London this year, commencing on July 23, those in attendance are cordially invited to make their headquarters at the London offices of the ALLIS-CHALMERS COMPANY, 533 Salisbury House, Finsbury Circus, where mail may be directed in care of Mr. J. W. Young, manager, who is also a member of the Institute.

Latest Market Reports.

ANGLO-AMERICAN SHARES.

Cabled from London.

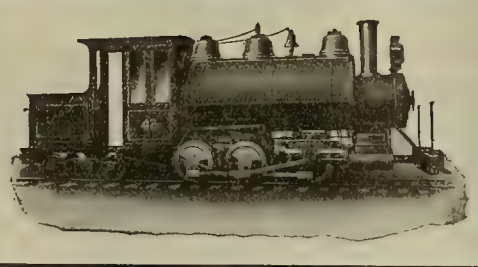
	June 28. £ s. d.	July 5. £ s. d.
Camp Bird	1 4 9	1 4 0
El Oro	1 6 3	1 5 0
Esperanza	3 17 6	3 18 9
Dolores	2 7 6	2 5 0
Oroville Dredging	0 18 3	0 17 6
Stratton's Independence	0 4 6	0 4 0
Tomboy	1 6 3	1 5 7½

(By courtesy of W. P. Bonbright & Co., New York.)

METAL PRICES.

By wire from New York.

	Average price for week ending July 5.	Average price for the month of June.
Lake	$18.55@18.75	$18.72
Electrolytic	18.15@18.40	18.45
Casting	18.00@18.12	18.21
Lead	5.75	5.75
Spelter	6.00	6.10
Silver	0.64⅞	0.6539



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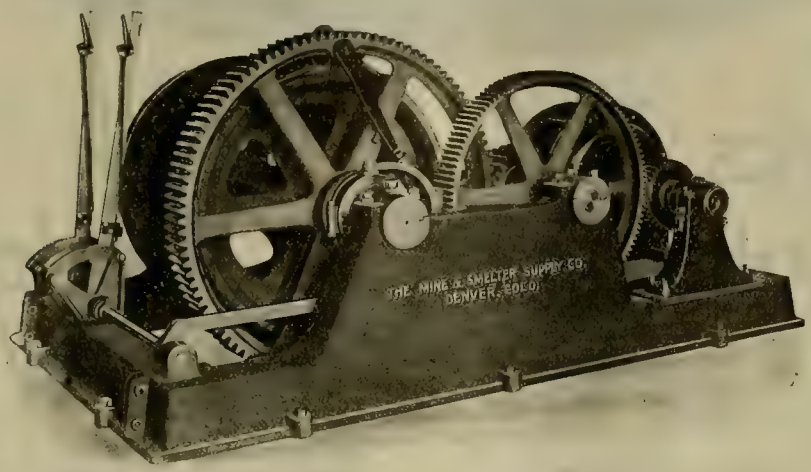
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Hampton, Wm. Huntley.

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Detty, W. E.
Erman, Joseph C.
Smith, Franklin Wheaton.
Tomlinson & Norton.
Williams, Percy.

CALIFORNIA.

Adams, W. J.
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Brown, R. Gilman.
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De Kalb, Courtenay.
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Halloran, Arthur H.
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Huntley, Dwight B.
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Janin, Stebbins & Smith.
Jones, Charles Colcock.
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Leggett, Thos. Haight.
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Nourse, C. F.
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Rickard, Edgar.
Rickard, T. A.
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Hills & Willis.
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Lamont, Eugene M.
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Rickard, Forbes.
Schroter, Geo. A.
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MICHIGAN.

McCormick, E.

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Turner, R. Chester.
Turner & Gates.

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Yeatman, Pope.

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Molson, C. A.
Neill, James W.
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Juessen, Edmund.
Lammers, Theo. L.

WYOMING.

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CANADA.

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Hoover, H. C.
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State Geologist of Wyoming.

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Arthur Philbrick.

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City of Mexico.

Continued on Next Page.

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Continued From Preceding Page.

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298 Steuart St., San Francisco.
Member Franklin Institute, Technical Society Pacific Coast, American Society of Mechanical Engineers, American Institute of Mining Engineers, North of England Institute of Mining and Mechanical Engineers.
Author of 'Practical Notes on Hydraulic Mining.'

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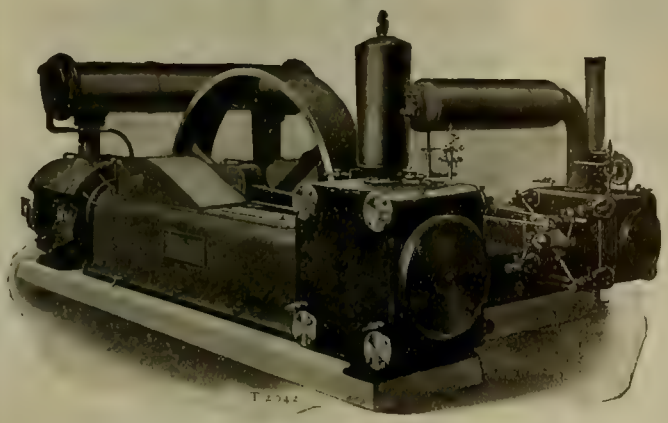
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Orders executed on London Stock Exchange. The complete facilities of our long established Colorado house enables us to confidently offer our services as financial agents to those having business interests in the West, and particularly in the Rocky Mountain region.

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FINANCIAL MINING AGENTS FOR THE WEST COAST OF MEXICO.
Mazatlan, Sinaloa, Mexico.
Mines Examined and Reported Upon.
Cable: Coleds. Codes: Bedford McNeill, A. B. C. 5th Ed. Western Union.
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THE NEW **"Imperial" Corliss**



The Finished Refinement of a Superior Design

A "high-duty" compressor in the economical sense. Equipped with the Rand-Corliss Steam Valve Gear, giving first class steam economy with high speeds. The most compact machine made, requiring less floor space than any other type. Absolutely automatic, with both lubrication and superior regulation. Capacities from 1000 to 6000 cubic feet per minute. The highest refinement of high-speed compressor design.

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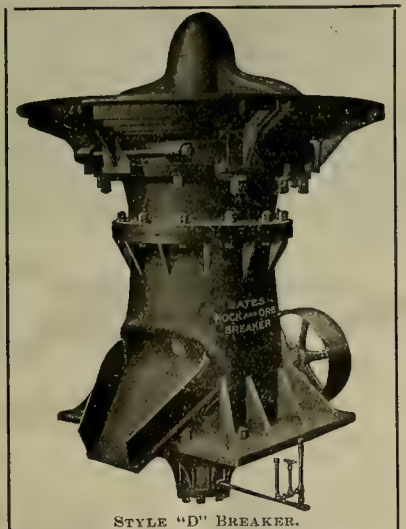
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Allis-Chalmers Company

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STYLE "D" BREAKER.

Embody all that advanced engineering skill, more than half a century of experience, and unsurpassed manufacturing facilities, represent in breaker construction.

THEIR RECORD

is a continuous demonstration of superiority over all other machines used for like purposes.

THE CAPACITY OF STAMP BATTERIES, TUBE MILLS

and other fine crushing devices is largely affected by the size of the ore fed to them. Published reports of leading mining companies testify to a great increase in their mill outputs after the introduction of our breakers.

OUR CRUSHING ROLLS

Are adapted to every variety and condition of service. Send for Bulletin 1412, which describes in detail our standard and special machines. You will find a large assortment to select from, enabling you to obtain just what you need for the particular requirements of the work to be done.

We furnish Complete Equipments for Mining, Milling and Smelting, as well as power units of every description, and Electrical Apparatus of all kinds. Why order from several companies when one contract will cover all?

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CHROME, N.J., U.S.A.
(FORMERLY OF BROOKLYN, N.Y.)

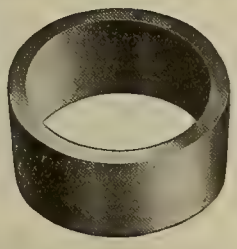
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Forged, Punched and Rolled from a Solid Chrome Steel Ingot.

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Best Material for

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DRILL BITS MADE OF

INTERNATIONAL

HIGH GRADE CRUCIBLE

Rolled Hollow DRILL STEEL



HAVE NO WELDS, consequently THEY DO NOT BREAK. The Hole is ROLLED in the BAR. ANY LENGTH, SIZE OR SECTION. Ask your DRILL MAKER for it, or write to us for particulars.

MADE ONLY BY

INTERNATIONAL HIGH-SPEED STEEL CO.

Fox Building, Franklin Square, NEW YORK

THE MURPHY AIR-HAMMER ROCK DRILL

DOES FIVE MEN'S WORK



Greenville, Cal.
Dec. 2nd, 1905

Gentlemen:

Regarding the Murphy Drills which you furnished us, we would state that it gives us great pleasure to recommend them. They do all you claimed for them, and more.

In our hard quartz we are drilling 1½ inches per minute; in fact we drill 11½ feet of holes in 1 hour and 30 minutes. Each drill is doing the work of 5 single-jack miners. We regard them as one of the best investments we ever made.

We remain,
Yours very truly,
Droege Bros. Mining and Reduction Co.
(Signed) Per Wm. J. Droege.

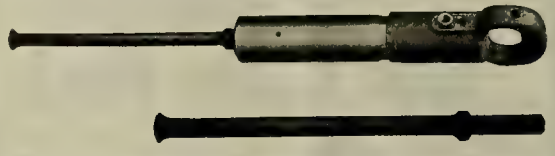
STRICTLY A ONE MAN DRILL

No weak or complicated parts to get out of order. Only 5 parts to the Murphy Drill. The Sponge attachment overcomes dust. Write for Catalog No. 12.

C. T. CARNAHAN MFG. CO.
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Bradley Engineering and Machinery Co., Spokane, Wash.

Shaw's Eclipse Air-Hammer Rock Drill



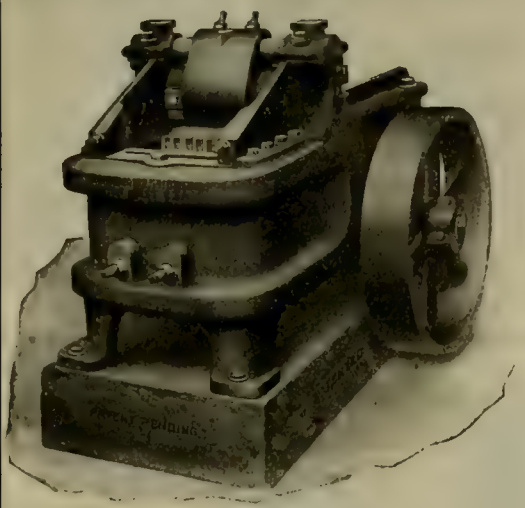
This Hand Machine is designed for all down-hole work in mines such as block-holing, sinking of shafts, down holes, in drifting or trimming or hitch-cutting, and will be found a very valuable tool both for efficiency, durability and economy of repairs. Some people are using this class of Machine for general work in mines, but would advise that it is pretty hard work to hold it to its work on uppers or stoping. Would advise the use of our Air Feed Machine for those purposes.



This Hammer is for Plug and Feather work in Quarries and Stone Yards, and will be found very efficient and durable.

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SOLE AGENTS United States, Canada and Mexico
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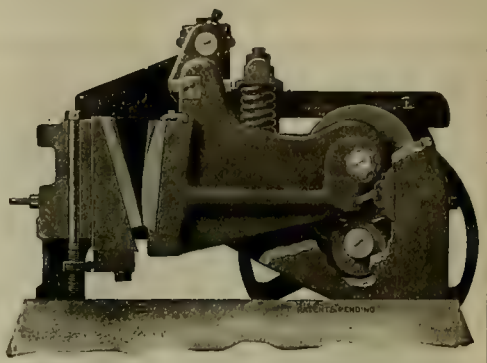
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ROLL JAW
FINE CRUSHERS

CRUSH TO 1/2 INCH

NO SCREENS



THE ONLY REALLY FINE CRUSHERS BUILT.
The jaws do not open and close at the bottom as in other crushers, therefore:
Set them to one-half inch and all of the product must be crushed to one-half inch or finer before it can drop through.

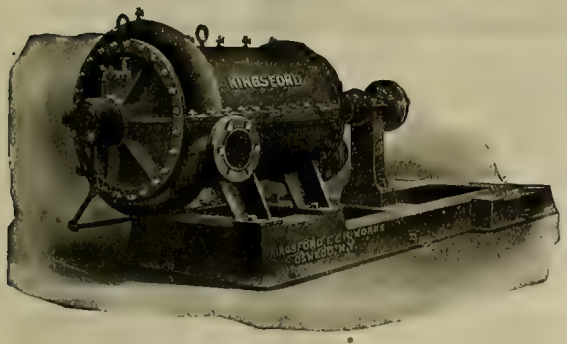
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(THE KINGSFORD KIND)



HIGH GRADE

CENTRIFUGAL PUMPS

ALL TYPES AND SIZES

PUMPS IN STOCK

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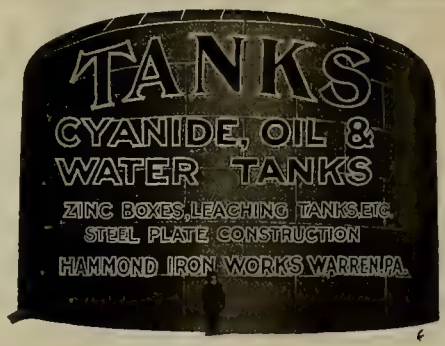
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NO EXTRA PARTS REQUIRED TO REPAIR LUNKENHEIMER VALVES WHEN WORN

A FEW MINUTES SPENT IN REGRINDING MAKES THEM AS GOOD AS NEW

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Largest Manufacturers of High Grade Engineering Specialties in the World
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Manganese Steel

PINS AND BUSHINGS, BUCKET LIPS AND TEETH, ROLLERS, GRIZZLES, CHAIN, WEARING AND CUSHION PLATES,

For Gold Dredges

CAST STEEL LINKS,
BUCKET BASES,
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Get only the BEST and keep down repairs and delays.

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HIGH BRIDGE, NEW JERSEY.



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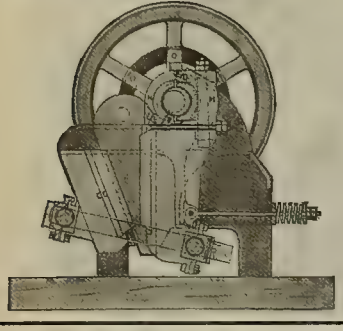
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AMERICAN LOCOMOTIVE COMPANY

Dredges of all Types and Sizes for every Class of Service

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SAMSON CRUSHER

will increase your capacity. For fine crushing, and for wet and sticky ores it has no equal. Maximum capacity; minimum power; uniform product

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STONE, ORES, GRAVEL, SAND, CLAY, COAL, CEMENT and all BULK PRODUCTS . . . . .

Our conveyors are in use all over the country, giving highest satisfaction to the users. With large experience in this field and well organized engineering and manufacturing facilities we are prepared to execute contracts of any size.

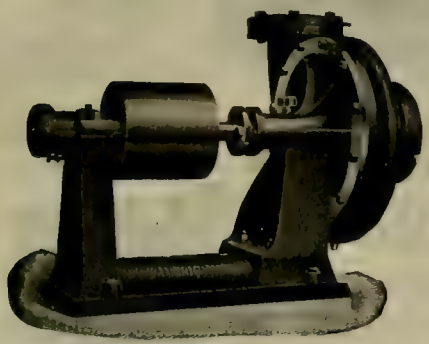
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The American Well Works

"LIGHTNING WELL MACHINERY"



Drilling Machinery for all kinds of prospect Holes and Wells

DEEP WELL PUMPS Which have Larger Capacity than any other Pump known
AMERICAN AIR COMPRESSORS of all Sizes and Duties . . . . . .
CENTRIFUGAL PUMPS of low pressure, high pressure and 2-Stage Pump . . . . .

We refer you to CALIFORNIA HYDRAULIC ENGINEERING & SUPPLY CO., of San Francisco.
TEMPORARY ADDRESS: 1169 JEFFERSON ST., OAKLAND, CAL.

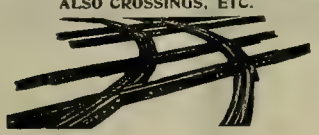
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ALSO CROSSINGS, ETC.



The Best of Colorado

The Scenic Features, the Mining Centers, the Commercial Cities, the Manufactories, the Smelting Interests, the Choicest Agricultural Lands, the Health and Pleasure Places, are all along or reached most conveniently from the

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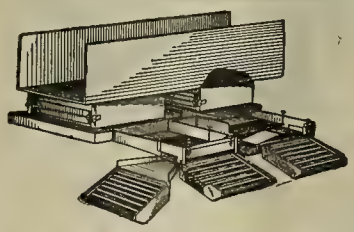
Many of the best parts of the State can be reached by no other railway. Are you interested in Colorado? Send four cents in stamps for our beautiful illustrated book 'Picturesque Colorado' to

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THE PIERCE GOLD SEPARATOR AND AMALGAMATOR

Saves Your { FLOUR GOLD / COARSE GOLD / QUICKSILVER

THIRTEEN IN USE IN ONE MILL IN COLORADO.



Will handle 50 tons in 24 hours.

Will do more and better work than plates, and only occupy 2 to 8 square feet of floor space.

For use in cyanide works, mills, dredges and placers.

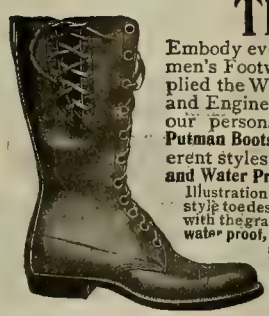
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Catalogue 10 Sent on Request.

L. S. PIERCE, Patentee and Manufacturer

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Embody everything that is practical in Engineer's and Sportsmen's Footwear. We have for over a **Quarter of a Century** supplied the Western Hunters, Trappers, Prospectors, Ranchmen and Engineers (who demand the best) and have learned through our personal contact with them **how** to make a perfect boot. **Putman Boots are water proof.** Send for catalogue of over 30 different styles of boots. Also **Indian Tanned Moose Hide Moccasins and Water Proof Shoes.**

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Malthoid Roofing and P & B Goods

Our factory at Paraffin, Alameda County, is uninjured, and we are prepared to fill orders at once for our products.

Malthoid Roofing
P & B Building Paper
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Baldwin Locomotive Works Manufacturers of Locomotives



Both Single Expansion and Compound and for all Gauges of Track

Locomotives particularly adapted for Logging and Industrial purposes and for Mines and Furnaces.

Electric Locomotives built in conjunction with the Westinghouse Electric and Manufacturing Company.

Electric Motor and Trailer Trucks for Railway and Suburban Service.

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Davenport Locomotive Works

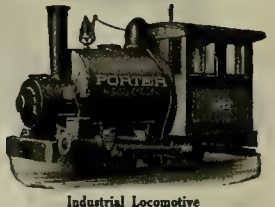
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All Sizes
Any Type
Any Gauge

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Light Locomotives



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Air Locomotive

STEAM AND COMPRESSED AIR

Compressed Air for Underground or Hazardous Surface Haulage—Most Economical. Dependable, Safe and Satisfactory. Illustrated Catalogue on application if mine owner or official. Address, mentioning this paper.

H. K. PORTER COMPANY, N. W. Corner Wood & Sixth **PITTSBURG, PA.**



FOR SURFACE HAULAGE

and for all Mining and Engineering operations there could be no better or more durable and economical Locomotives used than the Medium-weight ***SHAY GEARED LOCOMOTIVES.*** They are constructed of the best materials, by the most skilled workmen, and equipped with the most modern improvements and appliances. Second to none in efficiency.

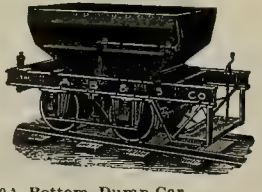
If we have not in stock the kind of Locomotives you want, or if you want one built for any particular road, we will be glad to prepare estimates and specifications. *Send for our Catalogues Nos. 10 and 12.*

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THE ATLAS CAR AND MFG. CO.
CLEVELAND, OHIO.

CARS OF ALL KINDS

Switches, Frogs and Equipments.



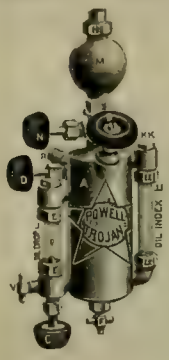
No. 150A Bottom Dump Car.

THERE is no unsupported 'theory' in our advertising columns. What there appears has cost millions in experiments; has been proved to be efficient and represents the most advanced state of the art.

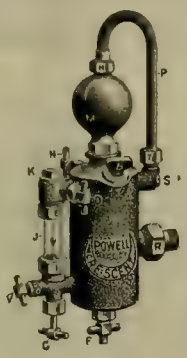
The Powell ENGINE AND BOILER TRIMMINGS.

We lubricate everything in the most thorough and modern manner.

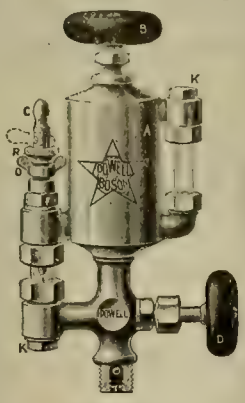
"TROJAN" Cylinder Lubricator

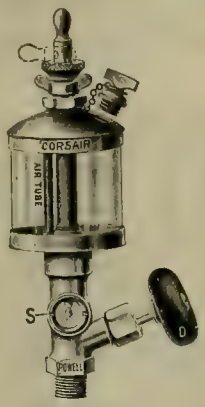


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"BOSON" AND "CORSAIR" for Gas Engine Cylinders





The old reliable "SIGNAL" Oiler



Tell us your valve troubles—are confident we can straighten them out—We make such a variety—and all of them good.

High Pressure "Powell White Star." Regrinding - Reversible Renewable



Medium Pressure "THE UNION COMPOSITE DISK"



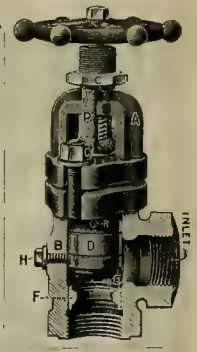
"TITAN" Lever throttle for Traction and Saw Mill Engines



For Medium Pressure and other Service "READY"



Keep them clean—Blow off your Boilers through our "CYCLONE"



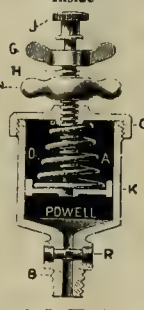
Grease as a Lubricant when fed through a POWELL Cup gives Excellent Service

"VANGUARD"

Outside



Inside

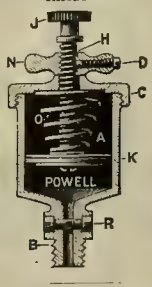


"RENOWN"

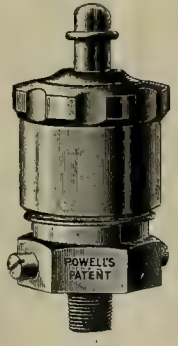
Outside



Inside



"COIN" Gives your monies worth



"BRUNO" All Iron—Best of All



For the convenience of our army of Coast friends, the POWELL output is in evidence at all Coast Supply Jobbing Houses, right at your elbows as it were. You don't have to wait but can get your wants filled immediately.

The WM. POWELL COMPANY, CINCINNATI, OHIO.

In Stock at the GAULD CO., PORTLAND, OREGON, BAKER & HAMILTON, SanFrancisco, S. J. SMITH Machinery Co., Los Angeles, California.

REPRESENTATIVES:

FRENCH & LINFORTH

1116 Broadway - - - Oakland, Cal.

The Compressed Air Machinery Co.

We are filling orders for Mining Machinery from our New Shop corner of Jessie and Ecker Streets, between First and Second, between Mission and Market Streets, San Francisco, California.

GIANT DRILLS and COMPRESSORS

WORD BROS. IMPROVED DRILL MAKER AND SHARPENER

BROWNELL ENGINES and BOILERS

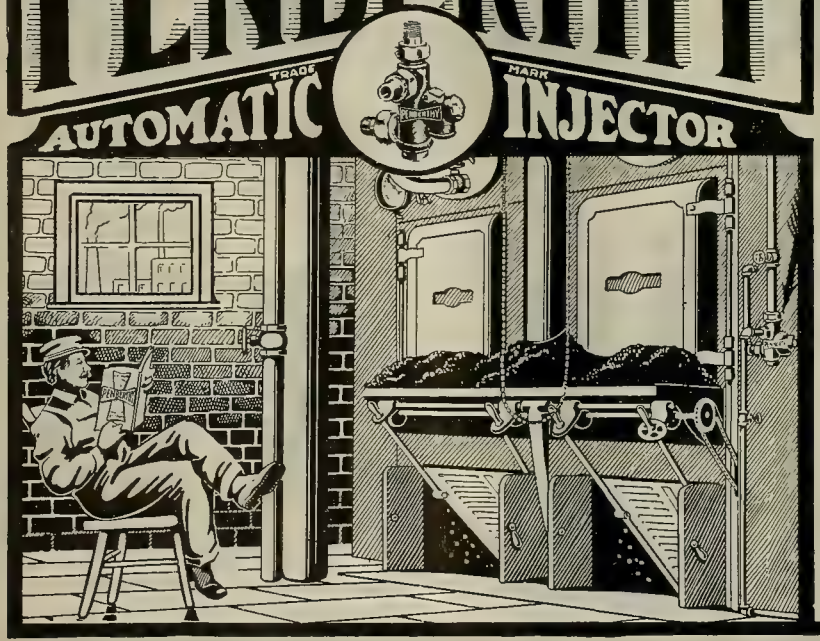
STEAM OR ELECTRIC MINING HOISTS

"It's Smooth Sailing When You Have a

PENBERTHY

TRADE MARK

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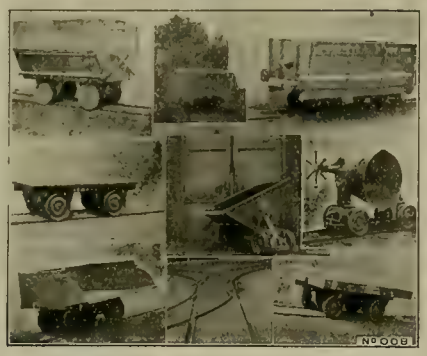
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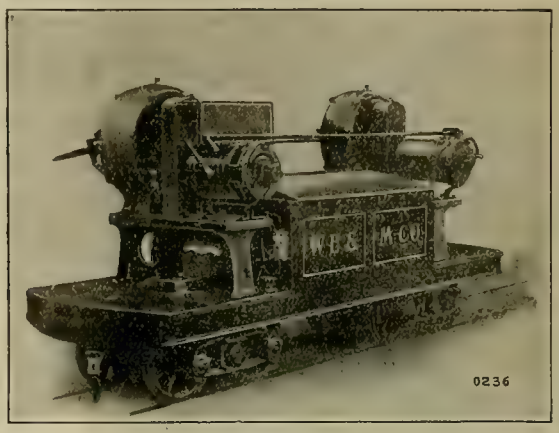
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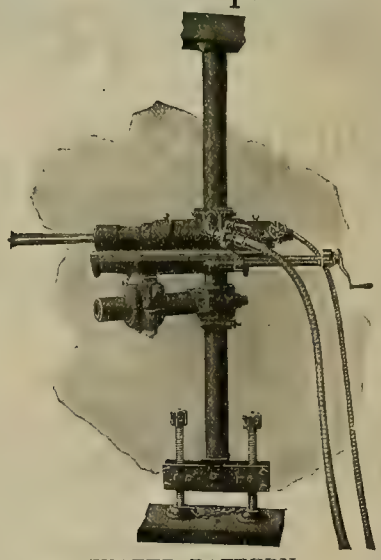
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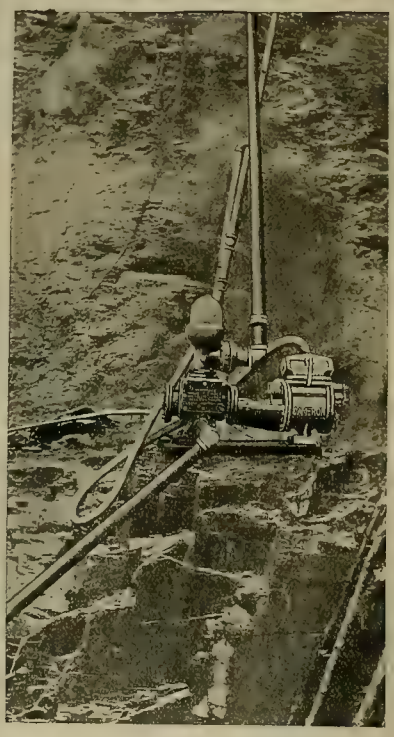


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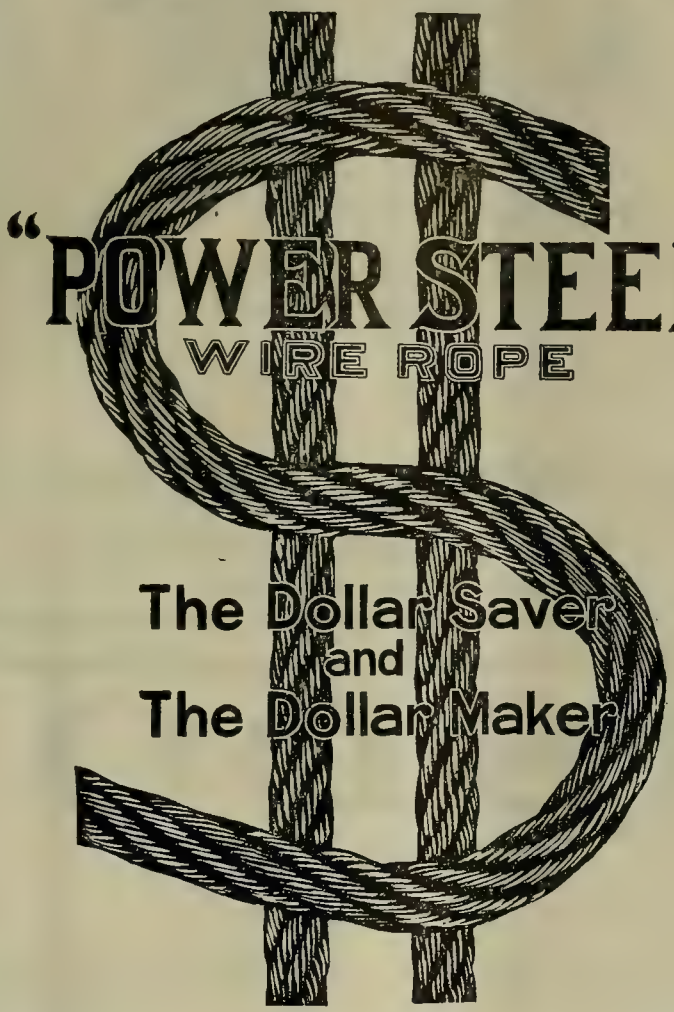
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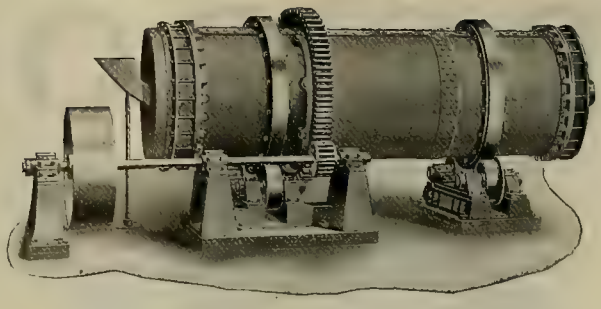
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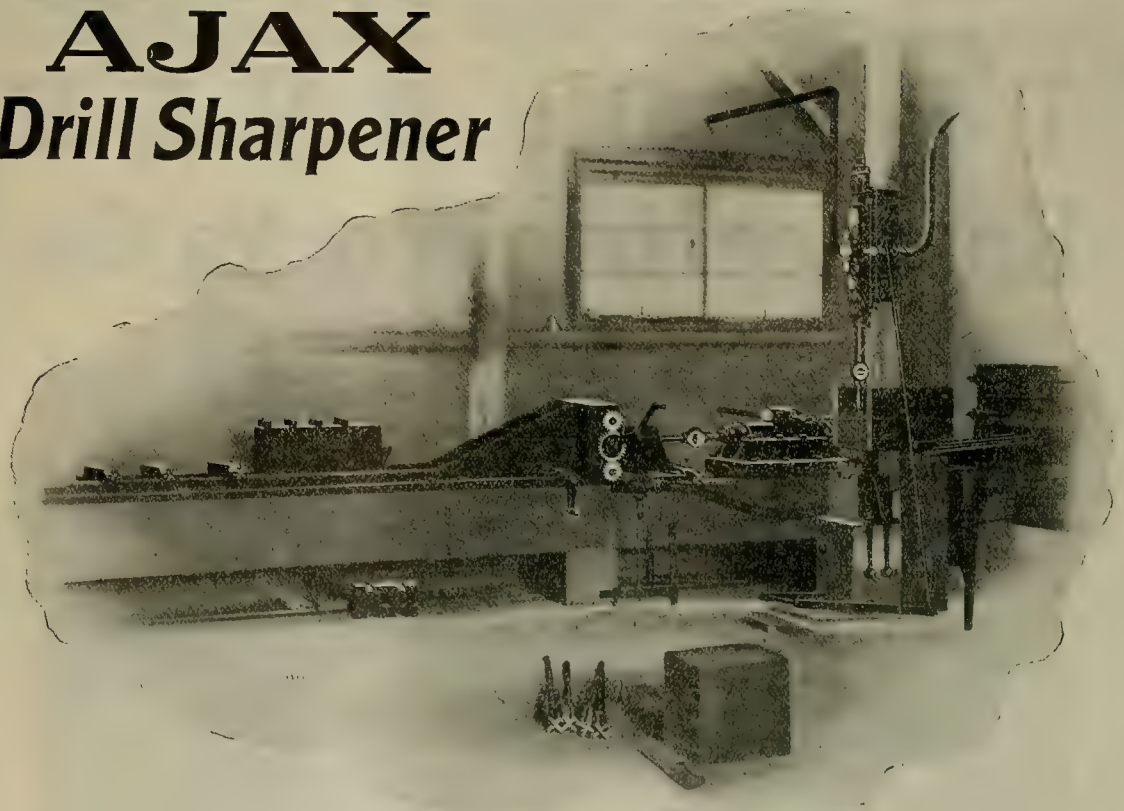
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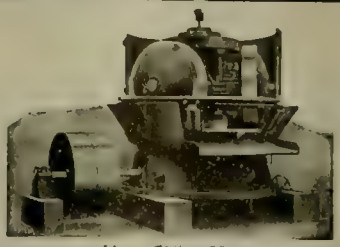
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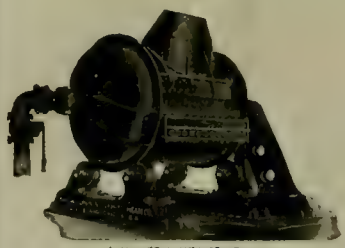


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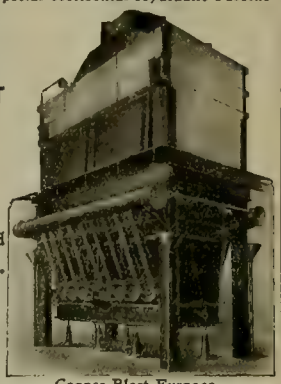
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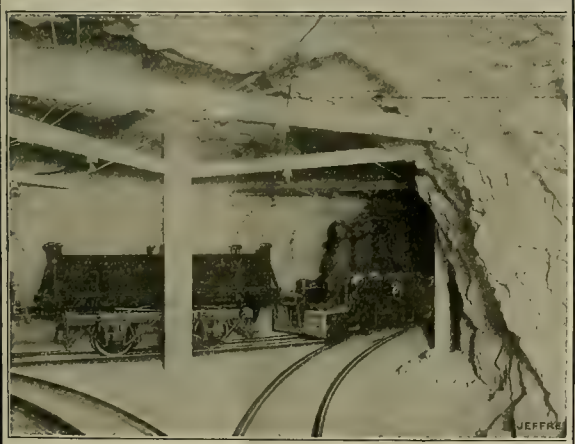
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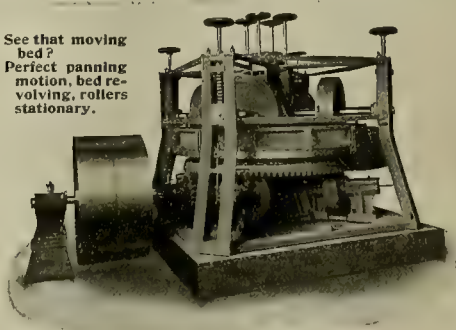
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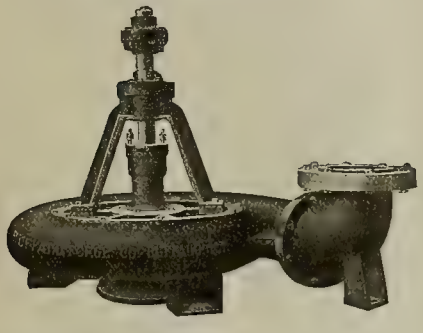
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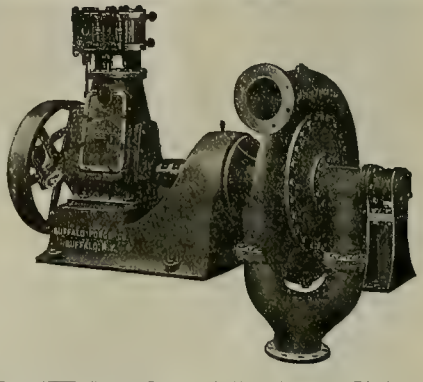
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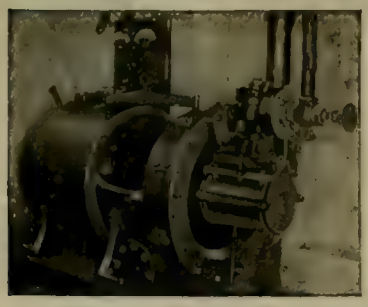
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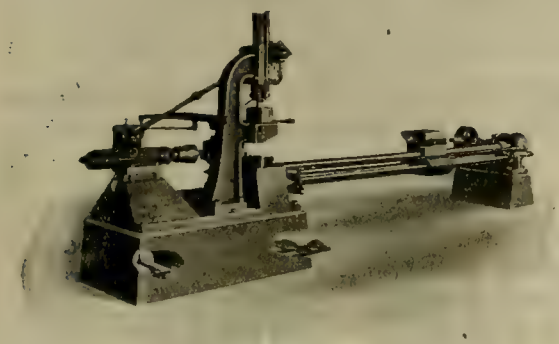
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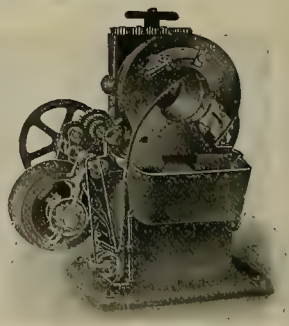
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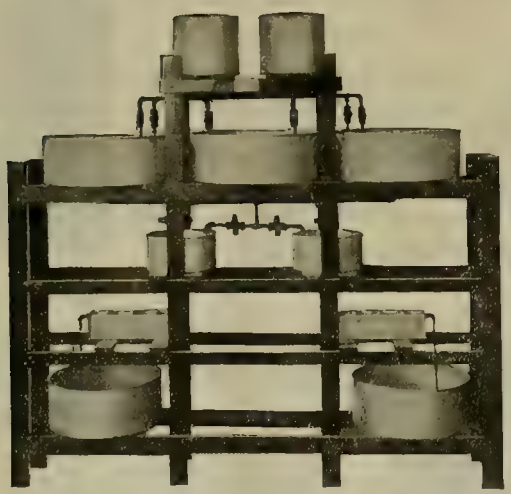
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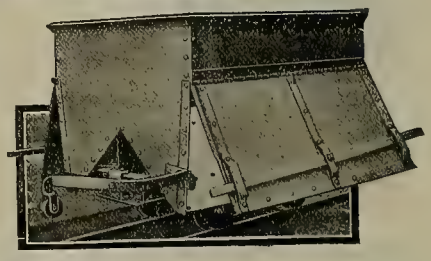
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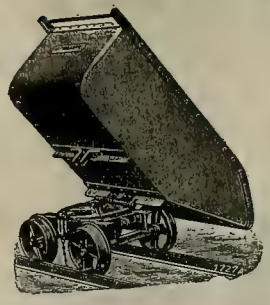


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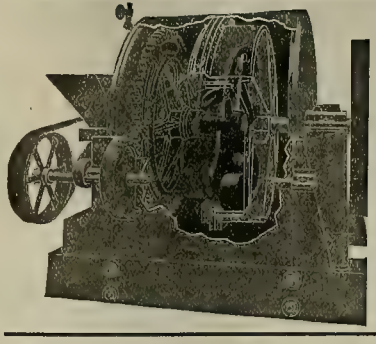
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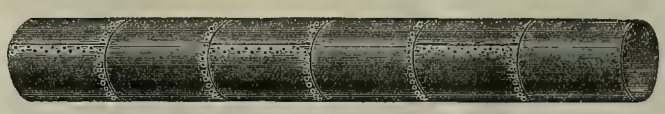
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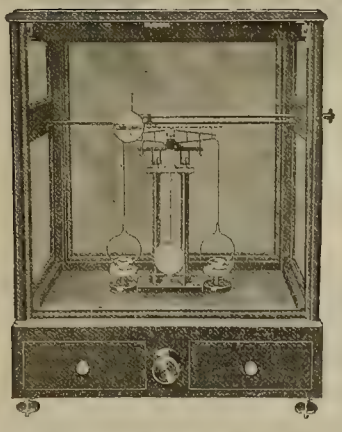
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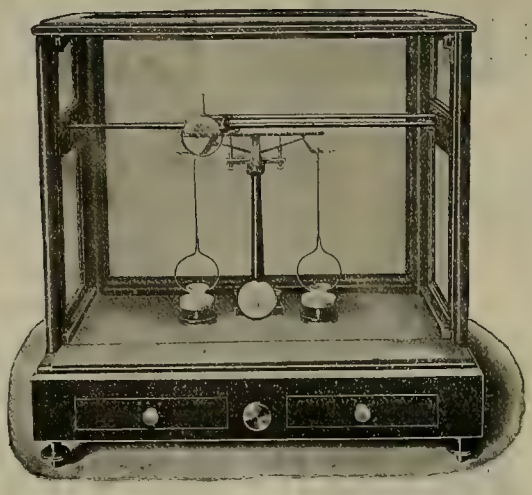
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Sensibility 1-200 Milligramme.

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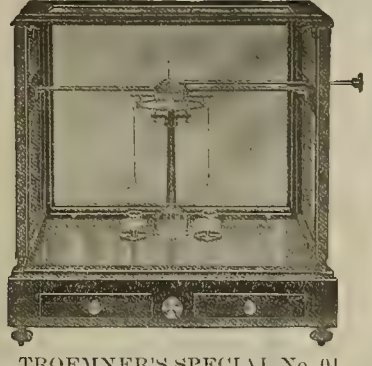
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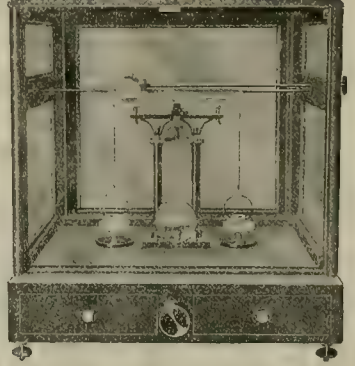
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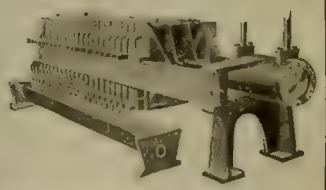
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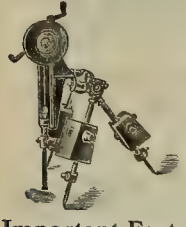
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Important Features :—
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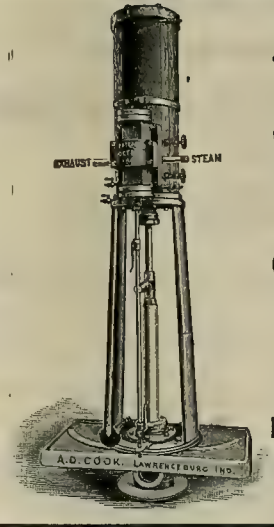
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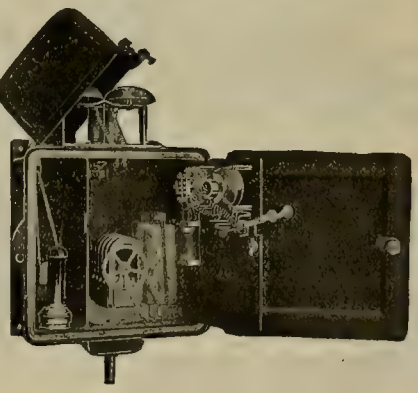
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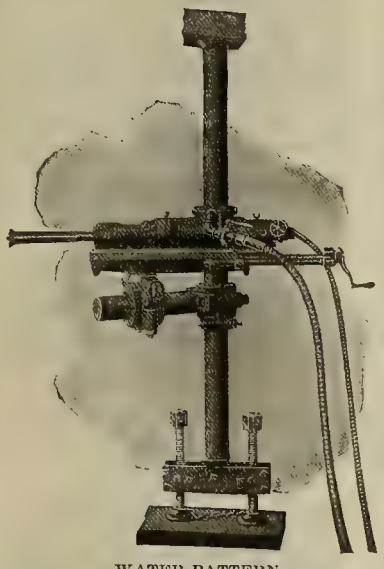
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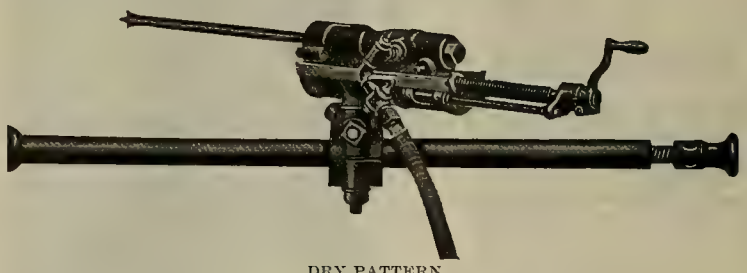


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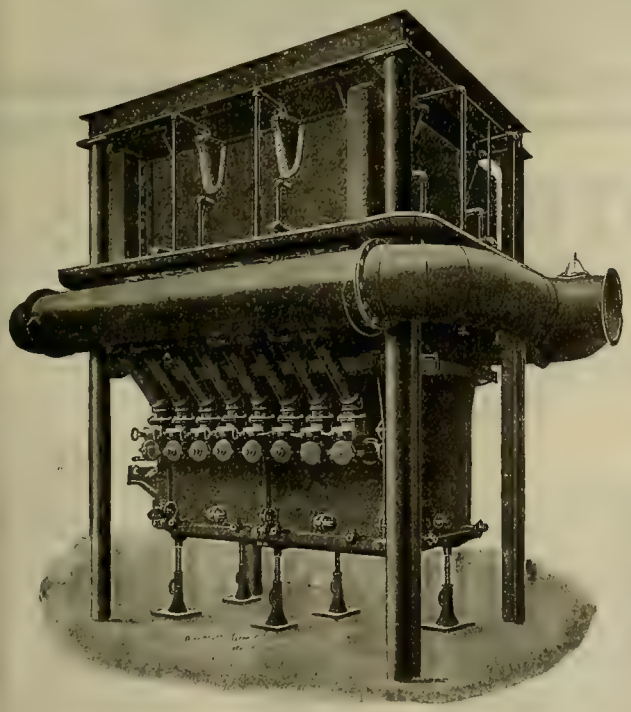
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Water-jacketed from hearth to feed floor. Furnace arranged for inside separation. Best appliance for heating blast. Sulphur in ore utilized as fuel. Producing higher matte and cleaner slag.

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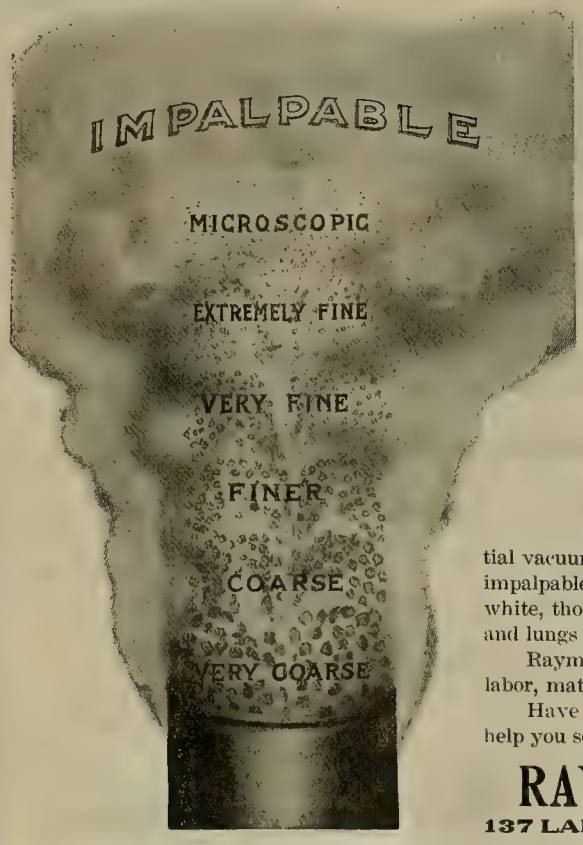
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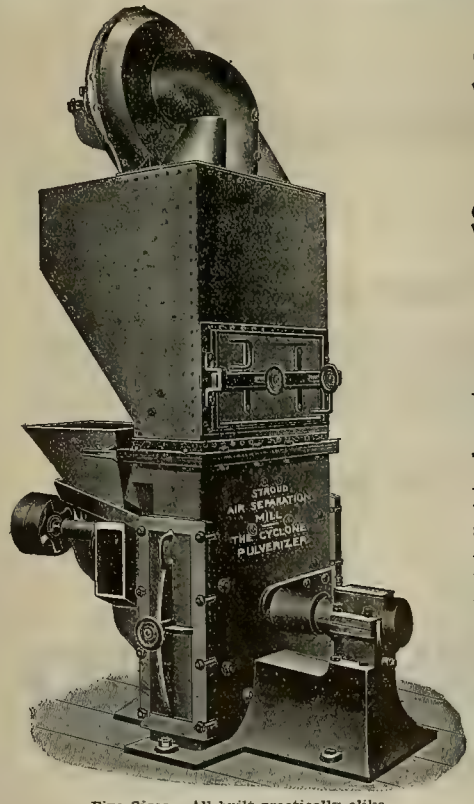
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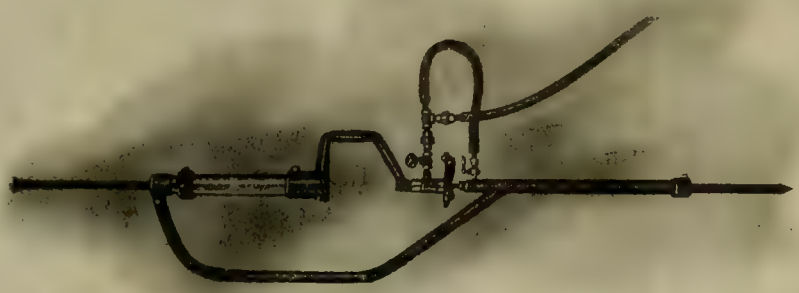
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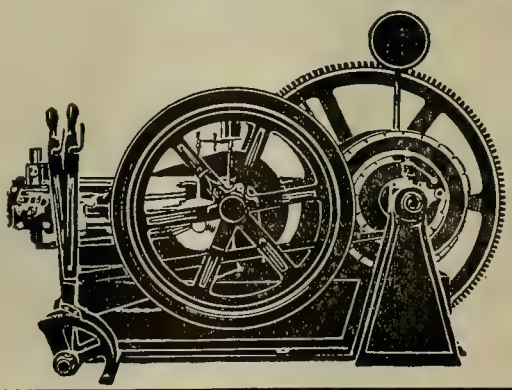
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USES CHEAPEST FUEL
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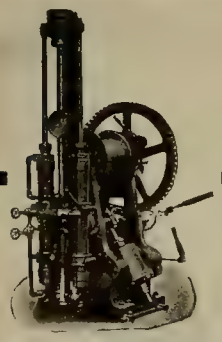
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CHRISTMAN DRILLING MACHINES

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They drill with cable tools, hollow rod, jetting system, or remove a core.
ANY SIZE. ANY DEPTH.
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The feed used on our core drills is hydraulic and the quantity of water admitted is controlled by a four-way valve. By this system, the amount of pressure on the bit is always under the instantaneous control of the operator. This is not the only point of superiority which our diamond core drills possess over others and we would like to have you write for our Catalogue No. 12 and learn about our drills in detail .. ..

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Wood Pipe — Woodwards Patent Machine Banded, Wheeler Patent Continuous Stave, Bored Wood Water Piped

Made from California Redwood or Selected Puget Sound Yellow Fir.

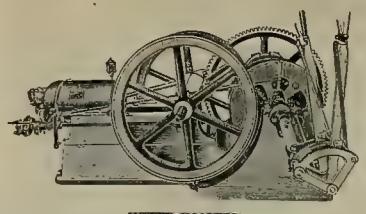
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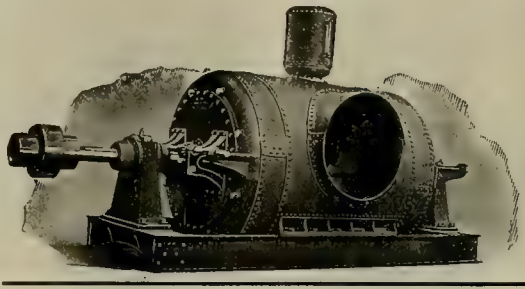
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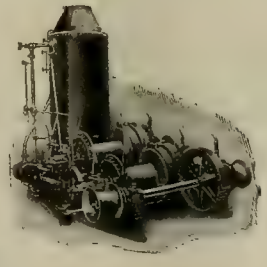
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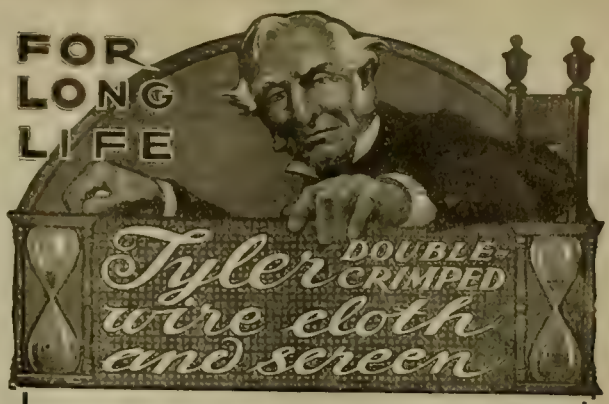
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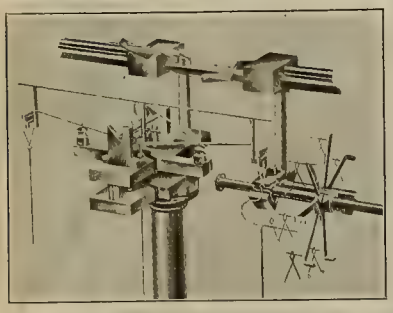
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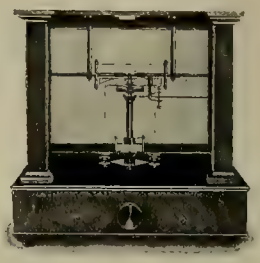
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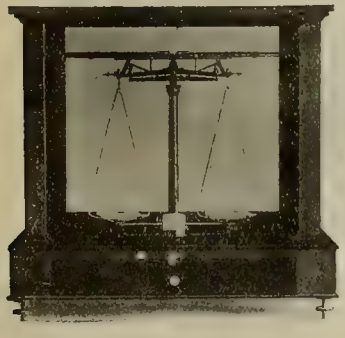
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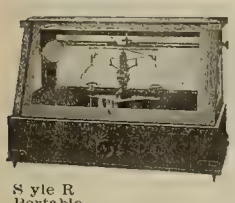
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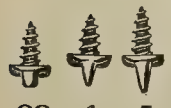
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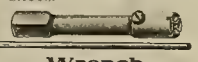
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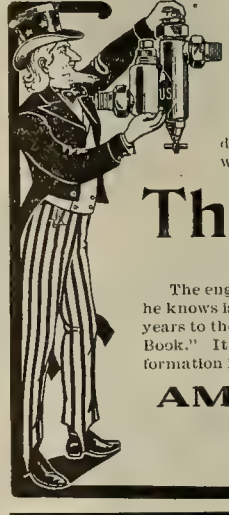
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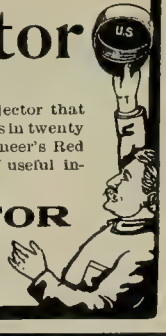
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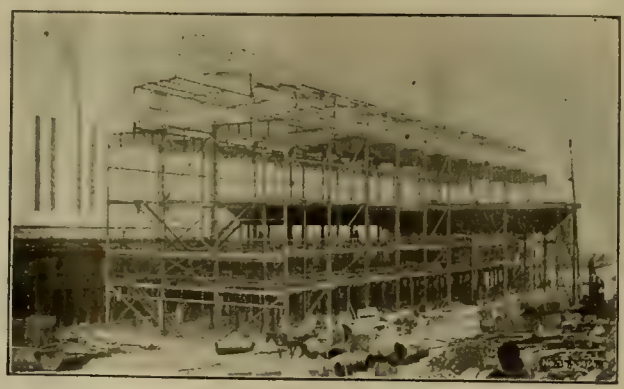
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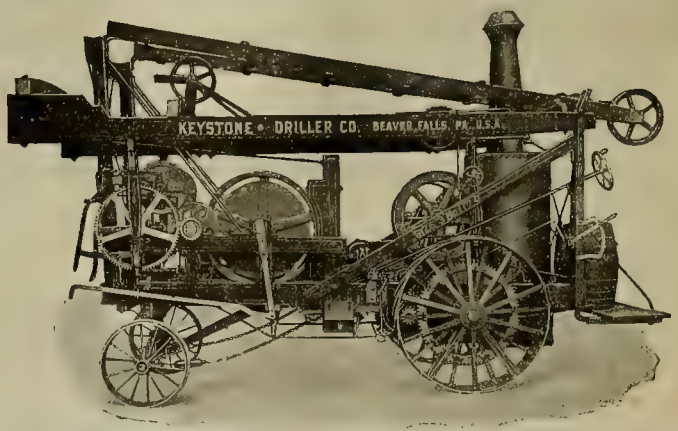
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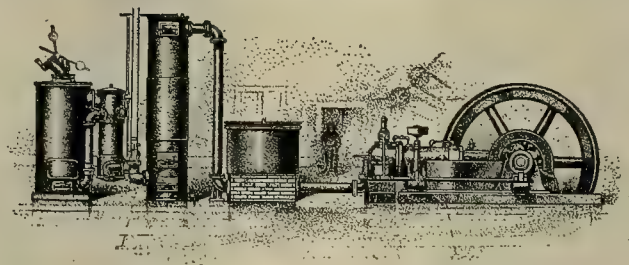
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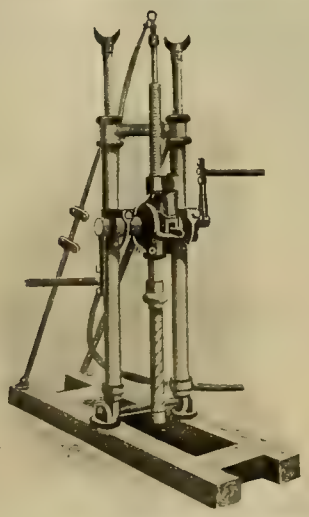
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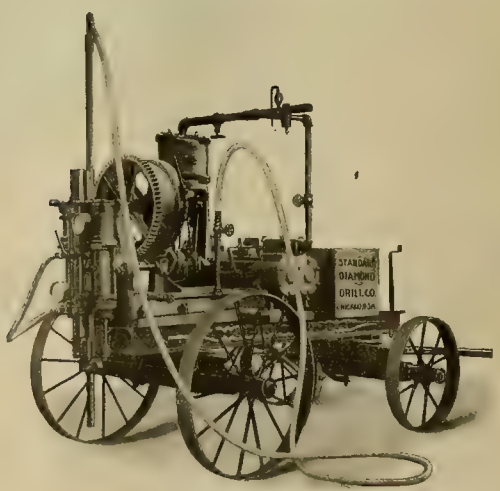
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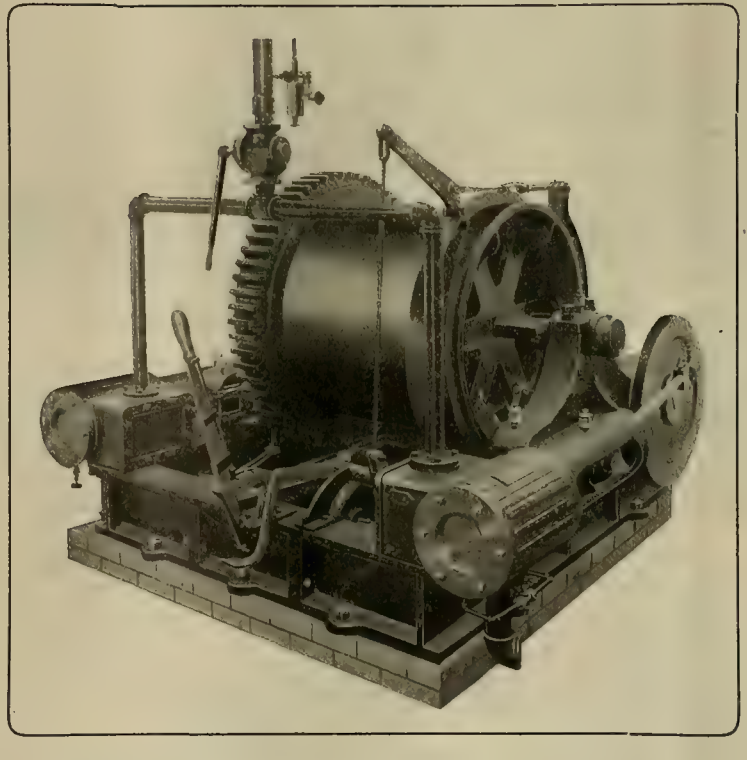
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Editorial.

IN THIS ISSUE we publish an article by Mr. F. W. McNair, president of the Michigan College of Mines; even apart from its authorship, the paper on 'How Bodies Fall in Deep Vertical Shafts' is bound to interest every miner. The daily press has given forth many queer versions of the phenomenon explained by Professor McNair and the love of the mysterious has been played upon in many keys. The truth will be found fully as interesting as its journalistic pseudomorphs.

WRITERS OF serious articles in the magazines ought to read mining papers, if they want to avoid needless blunders on mining topics. Thus Archibald Colquhoun has a thoughtful contribution on 'Great Britain and South Africa' in *The Outlook*, but he undermines confidence in his expressions of opinion when he falls into such errors as stating that "of the innumerable mines on the Rand only half a dozen are paying a dividend," and that gold mining at Johannesburg "has none of the adventurous and speculative elements elsewhere associated with it." There are over forty companies on the dividend list, the aggregate amount of profit distributed during 1905 being $22,500,000. If South African mining is not speculative, what is it? No mining district has been the basis for so vast a network of speculation and speculative finance as that around Johannesburg.

THE AMERICAN SOCIETY OF CIVIL ENGINEERS has proved its liberality of mind by admitting a lady to membership. A grand-daughter of Elizabeth Cady Stanton is the first woman member of this national society and the same progressive person was the first of her sex to take a degree as civil engineer at Cornell. On the surveying trips, this student was accompanied by her mother. She wrote a graduating thesis on 'The Flow of Water and Sand in Pipes under Pressure,' a subject that should interest some of our cyaniders. This substantial theme was well treated and marked her entrance into a manly profession. Since then an offer of important engineering work has come from China and it is quite possible that the railroad development of the Flowery Kingdom may eventually owe much to the gentle art of a woman, as creation already does, everywhere. We hope the lady will marry one of our mining engineers and retire from active practice.

AMONG THE SOOTHSAYERS shaken to the surface by the recent seismic unrest, was a negro street exhorter at Madison, Wisconsin. He predicted a calamity for a certain Sunday and so, on the Saturday previous, people prepared for it. Bank depositors withdrew their savings. A milkman reported that only three of his many customers ordered milk for the fateful Sunday morning.

Many of the people climbed to the neighboring high ground—the Blue Mounds—in order to escape the waters. The prophecy was that Madison would be engulfed by the two lakes between which it is situated. However, Madison is still there, and so is the University, and so is our friend Mr. Charles R. Van Hise, of 'The Principles Controlling the Deposition of Ores.' But what we lament is the obvious failure of the science of the University to penetrate the gray matter of the people of Madison. Instead of sermons, they need Professor Van Hise in the pulpit, to give them a few fundamental ideas of geology, so that they may go to sleep in peace and order their milk and not worry the bank cashiers.

THE PART THAT pyrite plays in the deposition of gold is a live subject, and our readers will be glad to have the article upon it by Mr. H. L. Smyth, professor of mining and metallurgy in Harvard University. The distinction between the two varieties of pyrite is important to the miner. In some cases the pyrite is simply an accompaniment of quartz deposited before the gold, and in others it is an accessory to the enrichment of the ore — possibly even an agent in the precipitation of the precious metal. The famous Indicator seam at Ballarat is a case in point; there the pyrite is laid down along a thin, but well-defined line of parting in the Silurian slate, and it is probable that the richness of the Indicator is due to the agency of its pyrite, which is known to act as a precipitant for gold solutions. In this connection we may refer to the fact that Mr. J. W. Gregory, professor of geology in Glasgow University, has demurred to the idea that the Indicator conforms to the bedding and refers to recent evidence, obtained by him, in proof of it being a cross-fracture. Mr. E. J. Dunn, the Government Geologist of Victoria, and well known to our readers as the writer on the Bendigo saddle-reefs, has denied this unconformability of the Indicator, a conclusion to which the present writer also arrived independently ten years ago. A fracture may be, in its origin, comformable and yet, in places, later movement may cause secondary breaks, leading to the formation of such tributary veins as appear to contradict the main testimony. Mineralization is not the act of a moment and the character of fractures underground is modified by local conditions.

Opinions and Their Value.

In times of mining activity in particular localities one is apt to read in the daily—or even weekly—papers, that certain parties of brokers and investors have visited the mines in a special car; this car is usually provided with all that is necessary to alleviate thirst in the deserts of Nevada or to allay the dust of the Salt Lake valley; therefore, it is not surprising that the impressions formed by the visitors is exceedingly favorable, nor is it astonishing that they deliver these opinions like oracles. In a recent letter from our Toronto correspondent, we were told that a large party of capitalists and mining brokers from New York had visited Cobalt, where rich ore is being found, and that the inspection of the camp by so many leading financiers was generally regarded as an important step toward inspiring public confidence in Cobalt stocks.

This brings up an interesting question. What value is to be attached to a broker's opinion of a mine? Brokers, who deal in shares, and capitalists, who have accumulated wealth, are credited by the public with a certain acumen or shrewdness, which is held to make them trustworthy guides. As a matter of fact, both classes of men are as helpless in a mine and as unable to make correct deductions from what they see there, as would be a cowboy in a battleship or an astronomer in a hayrick. Any mine superintendent will tell you that the easiest man to swallow the yarns of a garrulous shift-boss is a financier who thinks he can get at facts by personal observation of things entirely outside his ordinary experience, and that of all people to fill up with rosy stories of future development the most gullible is the broker who is keen on making the shares go up and wants a large store of optimism for distribution among his clients. Mining engineers do not go to farmers to get the rating of a bank nor do they ask a college professor to tell them which way the stock market will jump. Bankers can tell you whether they are going to put their money in a mine and brokers may be willing to inform you whether they are going to bull the market in that particular stock, and if they tell you these things truthfully, you are in luck, for by the use of this special information you may make a pot of money. But if you really want to know about the mine itself, its present condition and its probable future, go to the man who has spent his life in trying to equip himself, by education and experience, to advise you. Don't fool with the broker, go to the mining engineer.

Copper and Lead.

The metal markets have continued strong of late, despite increased production. In copper, the position is excellent; there are no stocks of any consequence in existence; consumption continues at a tremendous rate and the increase of production is not more than normal, so that no accumulation of the metal is likely for the present. Business at New York is quiet, mainly because the larger consumers are covered for the next month or two, and the depressed condition prevailing for the moment in the stock market has influenced buyers, who are holding aloof until the horizon becomes more clear. The threat of a return of the copper bought last year in China has vanished; the copper that was returned from China—and it was not much—has all gone into consumption; as far as we know there are no further stocks available there that could be re-sold in the American or the European markets. Unless something wholly unforeseen should happen, it is safe to predict that the present firmness of the copper market will continue during the remainder of this year, at least. In lead also the market continues unusually strong, the present production and stocks appearing to be inadequate to meet the enormous demand. The price, as is well known, is controlled by the American Smelting & Refining Company, so that it is subject to artificial conditions, but the policy of this corporation is conservative and we do not look for any reduction in the price, because general conditions do not warrant it.

By the Way.

IN a recent address to the graduating class of Lehigh University, Dr. R. W. Raymond made the following suggestive remarks on an important matter:

"Perhaps the commonest question of casuistry occurring in modern business is that of commissions. As the agent of your employers you have to purchase a steam engine. After getting the prices and inspecting the engines of all the manufacturers you decide upon the machine most suitable, on the whole, for your purpose, and in all legitimate ways beat down the sellers thereof to their lowest price. Just as you are about to close the bargain at the price, they say: 'This covers, of course, your commission of 10 per cent.' When you reply that you do not expect any commission and suggest that, instead of paying it to you, they take it from the amount of the bill they send to your employers they tell you that according to some trade agreement they cannot charge a lower price, but can pay a commission to the selling agent. Now, you are not the selling agent, but the purchasing agent, and, explaining this difference to them, you tell them that you will be in honor obliged to pay your employers whatever commission may be paid you. To this they reply, with a kindly but cynical smile, that they do not care what you do with the money after you have got it, and you see clearly that they regard your protestations of honor as part of the formula which precedes your acceptance of the money. They do not really believe that you will not keep it if you get it.

I am repeating an episode of my own experience, and perhaps my solution may be of use to you. I declined the commission offered in currency; required it to be put in the form of a check to my order; indorsed that check to the order of my employers and presented it to them, leaving them, if they saw fit, to return it to me as a legitimate perquisite of my position. They did not see fit, and they were quite right. But the most important feature in my action was that the return of the check, thus indorsed by me in their favor, convinced the manufacturers of my honesty as no amount of high-toned oratory on my part could have done."

IT must not be forgotten that the whole prosperity of the Transvaal under Kruger was built up on the profits of the mines—before 1885 (a couple of years before the Rand was opened) the Transvaal was practically bankrupt. The Orange River Colony—an agricultural community of thrifty farmers—also owed its progress very largely to the mining industry, since the receipts from the railway which fed the mining district to the north constituted a major part of its revenue. Now, without revenue, one cannot have any of the essentials of progress. Education, for instance, needs to be supported by the State if it is to spread among agricultural districts, and one of the greatest difficulties of the Boer republics in their earlier days was the objection of the Boer to pay taxes. Therefore the creation among them of a revenue-producing element was a direct and immediate benefit, and, as such, was not despised even by the most Pharisaic old *veldt* Boer, who professed to regard the whole mining community as godless and depraved.

It cannot be too clearly understood that, as an agricultural or pastoral country alone, South Africa was never able to hold its own. The diamonds of Kimberley redeemed the situation at a critical period in Cape Colony, and without mineral wealth not one of the colonies could ever be successfully developed. Wide as is this assertion, it is, I believe, justifiable by facts. South Africa is in parts excellent as a pastoral country. There are, all over the land, spots (pockets they are termed) of soil of peculiar richness, suitable for agriculture; but the conditions of climate, the lack of natural communications, and the erratic conformation of the country make it impossible that these regions should develop as the Australian sheep and cattle 'runs' have done, or like the wheatfields of northwest Canada or the Argentine. Irrigation on an extensive scale is necessary to carry agriculture beyond a primitive stage, and the expense and other drawbacks of irrigated produce which has to be conveyed by rail do not allow it to compete in the world's markets with those of countries where nature does everything.

The rise of great industries in such a country is essential to its development, and is recognized as such even by those who, very rightly, regard agriculture and pastoral farming as the ultimate, permanent source of prosperity. The duration of the mines—or rather of the banket formation, which is practically the only payable one in South Africa—is variously estimated, but recent investigations seem to show definitely that, even at an increased rate of output, there is enough banket to last at least a hundred years. Those who care to look forward further may reasonably hope that in that time the country will have reached a stage of development in which other industries will be able to take a prominent place, and, especially, that long before that time the lack of natural communications will be artificially supplied and the work of irrigation accomplished.—Archibald R. Colquhoun in *The Outlook*.

"IF I go into a saloon for a glass of beer," declared a loyal union cigar-maker, at a meeting of the Central Federated Union yesterday, "and I see non-union bolognas, I walk right out." He might be excused, in these troubled days, for walking right out if he merely saw bolognas on the free lunch counter. But there is implied in his words a fine enthusiasm for union principles—let the mottled segments but show the mystic label, and this man would not only drink his union-made beer, but would eat his sawdust, candle-ends, and tow, disguised as bologna, and be virtuously refreshed thereby. Bit by bit, the horrible treachery of the average workingman is being exposed. He buys boycotted beer merely because he likes it; he smokes non-union cigars, and is not choked by the fumes; his wife is allowed to patronize non-union bakeries; his children go to school to be taught by unorganized 'scab' teachers; and, worst of all, when he arrives at the dignity of an office in the Central Federated Union, he neglects to find out whether the horse he rides in the Labor Day parade has been shod by a union horseshoer. These are all preventable blunders. Let no guilty union man say that he forgot or that he didn't know, or that his wife didn't ask him. It is only by the rigid observance of such minor points of doctrine that the majesty of the whole union theory is borne in upon the toiler.—*The Evening Post*.

IMPORTANT experiments are being carried on by the naval authorities at Portsmouth to ascertain the extent of the steaming properties of Welsh coal which has been improved by storage in the sea. Eighteen months ago iron crates, each containing two tons of coal, were sunk in the big basin in the dockyard. At the same time a similar quantity of coal was carefully stored in the open air at a coaling point and sheltered by tarpaulins. At intervals of six months two ton samples of each storage have been taken carefully and burned. The results have shown conclusively that by the submarine storage of coal its calorific value steadily increases, while by storage in the open air a decided decrease is shown. At naval coaling stations in the tropics the decrease in calorific value is very great.

Special Correspondence.

LONDON, June 27.

It is refreshing to turn from the meanderings of "Our Cornish Expert" and others amidst the scenes, more or less fabulous, of bygone times to some record of actual achievement of today. The inception of the Cornish Consolidated Tin Mines, Ltd.—'Cornish Consols'—was noticed in my correspondence of April 11. At the statutory general meeting last week the chairman, Mr. Francis Allen, gave the shareholders an account of what the directors have done since the company began operations. Referring to the financial position, he reminded the meeting that they started with a subscription of £50,000, and had actually called up and received out of that sum £26,000, leaving a further £24,000 to call, if wanted. The first deal which they took up on behalf of the company was one known as South Crofty, a cost-book company, worked on the old system. That company had practically no working capital, and they were selling, at the time, some 25 tons per month of concentrate, and this concentrate was fetching about £13 below the proper value of the tin sales. An arrangement was now made with the cost-book proprietors to register a limited liability company with a capital of £50,000, £40,000 of which was to be issued, as to £20,000 of it by subscription from the 'Cornish Consols' company and as to a further £20,000 by allotment to the vendors in the shape of 20,000 shares 15s. paid, leaving 5s. per share to be called up from the actual vendors themselves, so that the South Crofty Co. will have a working capital of £25,000, which is thought to be ample for all its requirements. The South Crofty Co. will in the first place reorganize the dressing plant, which is out of date, and will re-arrange the crushing capacity so as to deal with an output of 100 tons per day, which should result in sending to the ticketings not less than 40 tons of concentrate per month, and this concentrate should also in future fetch its proper price. The company will also install an electro-magnetic separation plant, so as to obtain the full value of the wolfram and produce a clean tin concentrate. Under the guidance of Mr. Arthur Thomas (manager at Dolcoath) the developments are to be pushed actively, and after the re-arrangement of the dressing plant is completed, there should be available 100 tons of ore per day. The chairman said that the tin lode was of an average of about 50 lb. per ton, which left a substantial margin, and he thought there was no doubt that South Crofty, with its modest capitalization and its ample working capital, would become by far the biggest dividend-payer in Cornwall. The next enterprise taken in hand by 'Cornish Consols' was the flotation of the Gunnislake mine, a subsidiary to the Clitters United Mines, Ltd. In this case they had arranged to guarantee the capital of £15,000. Then they had gone into another channel and taken up from the 'mineral lords' mines which they believed to be good, and which they held from the lords on reasonable terms. The first of these was the South Phœnix set, situated about five miles from Liskeard, received by direct grant from the Duchy of Cornwall. This lease cost the company nothing. The output of that mine for the eighteen months prior to closing down was, roughly, nine and one-half tons per month. Another lease had been secured, known as the Wheal Sisters mine—really a group of four mines—in the St. Ives district, near Trencrom hill. That also was a mine which in the past yielded rich returns, but which at the present time is under water. During the years 1876 to 1879 the average sales amounted to about 500 tons per annum; but unfortunately the price of tin was then at an average of under £40 per ton for black tin. The present price is about £108. In this case also they would set to work to unwater the mine, and erect a dressing plant, so as to bring the property to a producing stage. Incidentally, the chairman mentioned that they had also invested a small amount in shares of a syndicate recently formed, called the Duchy Development Syndicate, its object being to establish an electric-power plant in Cornwall and supply many of the mines, and that the first plant will be established at Hayle. So much for the prospects of 'Cornish Consols.' It would appear that its available cash capital is none too large for the various projects in hand.

Mr. J. H. Collins, the treasurer and honorary secretary of the London and West Country Chamber of Mines, has been lamenting the fact that the Chamber receives so little support, no increased enthusiasm being visible as the result of the revival of mining in the West. Men of West Cornwall will notice with regret the death of Mr. J. J. Truran, who came to London in 1858 and was for over 20 years the secretary of the Frontino & Bolivia and other mining companies. It is said of him that he never bought or sold a share in any company with which he was officially connected.

The directors of Dolores, Ltd., are determined to keep their shareholders posted as to what is being done at the mine. They have issued a fresh circular in which the starting of the cyanide plant is noticed and some results are given for the twelve months since the commencement of milling to April 30. Remarking on these, Mr. John B. Farish comments on the favorable position that the stoping has brought forth over the estimated amounts of ore available in the mine, though he points out that under such circumstances as in Blocks 7 and 11 where they have largely over-run in values, the cream of the block is undoubtedly taken out. As against this, however, he mentions that Blocks 8 and 9 and 18 show how the richer ground has exceeded its estimated value. The figures based on the weighing record, and the chute-sampling in the mine, show a fraction over 7,000 tons trammed to the mill during the 12 months in review with an average value of $89.52, the battery-sampling during the same period showing an average value of $80.79. Mr. Farish thinks that the battery-sampling is probably the more correct, though the figures coincide very well, considering the high grade of the material involved. The circular states that for the year the net profit at the mine (after charging all development work), amounts to $244,482, with the amalgamation part of the mill only in operation and less than half the number of stamps erected running. With regard to Cross-cut No. 1, mentioned in my correspondence of last week as showing ore 35 ft. wide with an average assay of $101.50 to the ton, according to the circular this cross-cut (in the bottom level) is at a point 464 ft. from the southern edge of the ore-shoot and 108 ft. from the northern fore-breast of the level, driven on the course of the lode, as on April 30.

Under 'Sampling and Values' Mr. Farish remarks: "The most interesting item under this heading is the fact that the tramming records from the hanging-wall Cross-cut No. 1 show that 14½ tons of ore were extracted with an average value of $137.88. This ore being heavy sulphides was placed temporarily on the dump." The widths of ore stoped in April were again considerably in excess of the original estimates, although the greater width decreased the average assay. It is clear that Dolores ore-reserves are coming out of much greater value than originally anticipated. On this point, however, it is reported that the engineers drew attention distinctly to the fact that in many instances the workings (upon which the estimates were based) did not develop the whole width of the vein.

The general carry-over reveals another disappointing account in the mining market. The Kaffir incubus continues to drag everything down. Tin mines are off color, no assistance being forthcoming from the situation of the metal, and the heavy priced copper shares show a considerable decline in value.

TORONTO, July 6.

The decision in the action brought by the Ontario Government against the White Silver Mining Co., setting aside the leases of Cobalt mining property on the ground that they were secured by false affidavits, is likely to result in a plentiful crop of similar suits. Before any such action can be brought, application must be made to the Attorney General, who must be satisfied that a strong case has been made out before a writ will be issued. Applications have been made to Attorney General Foy for the issue of writs to cancel the leases of three locations of 40 acres each held by the Temiskaming & Hudson Bay Mining Co., near the town of Cobalt. These proceedings are taken on behalf of prospectors who claim to have made the discoveries on these locations themselves, and that the mining company obtained the title through misrepresentations. They also assert that the company has failed to conform to the mining regulations.

Charles M. Schwab, the steel magnate, is looking to Cobalt as a promising field for investment. The camp was recently visited by Donald Gillies, formerly manager of the Tonopah Extension mine, and now closely identified with the Schwab interests, who, after acquainting himself with its possibilities, reported in the most favorable terms as to the prospects of the industry. Mr. Schwab will shortly visit Cobalt personally. Frederick E. Weekes, representing the Guggenheimer & Vogelstein interests, has also visited the camp, and the favorable impression made upon him is expected to have important results.

A syndicate of Canadian capitalists, comprising John R. Brodie and William Law, of Winnipeg, and John F. Lennox and W. A. J. Bell, of Toronto, has bought the northeast quarter of Lot 4, Concession 11, Lorraine township. A big find was recently made on this location by John H. O'Neill who struck ore three feet from the surface, assaying 659 oz. silver per ton.——C. A. Phillips, of Parry Sound, Ontario, has bought the McCrea property near Mud lake, Coleman township, the price paid being stated at $25,000.——M. L. Foley, representing a recently organized Winnipeg company, is operating in Bucke township. It is also working a rich copper proposition in Forbes township on the Quebec side of Lake Temiskaming, formerly known as the Guy-Girard mine. This vein averages six feet in width and extends for upward of a mile.

A rich strike of gold-bearing quartz and free gold is reported by two prospectors at Hudson Bay portage, Opastica lake, in the Temiskaming district on the Quebec side of the boundary. The news, which has been confirmed, has produced great excitement in Quebec Province and the Mining Department at Quebec city has disposed of a number of locations.——Work will shortly be resumed at the valuable sulphide property near Pelican falls, in the Wabigoon district, where operations have been suspended for six months E. R. Michie, the manager, is arranging for carrying on the work, which will be conducted on a larger scale as soon as direct railroad communication is secured by the construction of the Lake Superior branch of the Grand Trunk Pacific. ——At the Redeemer gold mine in the Wabigoon area crosscutting to the north from the 200-ft. level disclosed rich ore containing 75 % iron pyrite. The ore and pyrite will mill over $100 per ton. Eighteen feet of solid vein matter have been opened up. At the Little Master gold mine a contract has been let for underground work including between 300 and 400 ft. of cross-cutting and driving. At the Victoria mine the shaft has been unwatered and work started on a highly mineralized zone.

The Consolidated Mining & Smelting Co., of Canada, controlled by the Canadian Pacific Railway interests, which owns the Centre Star, War Eagle, and other British Columbia mines, and the Trail smelter, has acquired the Snowshoe group of gold and copper mines from an English company. These mines were extensively operated some years ago but active work ceased because it was found unprofitable owing to the low grade of ore and the long haul to a smelter. The combination of mining, smelting and transportation interests represented by the Consolidated Mining Company will probably solve the difficulty.

Premier Whitney and other members of the Ontario Provincial Government were interviewed yesterday by a deputation representing the miners and prospectors of Cobalt and the adjacent region, urging redress of the grievances of which they complain under the working of the new Mining Act. After a two hours' talk, Frank Cochrane, the Minister of Mines, said that the Government would accede to their wishes as regards the main cause of complaint, namely, the receiving of a second application for locations before the first was disposed of, and permitting the second applicant to prospect while the first was still at work. That would no longer be done. The delay in inspection, which had been the source of much dissatisfaction, would be remedied by the appointment of more inspectors. As to some of the other matters, it would require legislation to effect a change.

J. B. Prevost, the Provincial Minister of Colonization, Mines and Fisheries of Quebec Province, has left for the newly discovered goldfields of Lake Temiskaming to investigate and report to the Government. The discoveries are situated two miles east of the Hudson Bay Co.'s post at the north end of Lake Opastica. The route includes a chain of navigable waters from the south end of Quinze lake to Lake Opastica and a land portage from Ville Marie on Lake Temiskaming to the south of Quinze lake. The richness of the discoveries is fully confirmed.

DENVER, July 10.

That the Old Town mine in Gilpin county has been opening up nicely has been known for some time, but the extent of the discoveries has only recently been made public in a definite way. There is $300,000 blocked out between the 14th and 15th levels. The ore-shoot is 160 ft. long and averages five feet wide. The average grade is given at $35; this estimate was made by Manager Kimball, and afterward confirmed by W. H. Wiley. There are other orebodies in the mine, but the one above mentioned is the largest single block and the only one definitely estimated. The reason for making this close estimate was to see if certain improvements, requiring the expenditure of a large sum of money, would be justified. The one block of ore above mentioned justifies the improvements, so there was no need of carrying the rigid examination further. It is planned to sink the Old Town shaft to the level of the Newhouse tunnel and to connect the bottom of the shaft with the Newhouse. The shaft is 1,500 ft. deep now and will be 2,300 ft. deep when it reaches the tunnel level.

Mr. J. A. Redding has been appointed foreman of the Old Town. Mr. Redding comes from the Maple Leaf mine in Gunnison county, where he has been under Harry Lee (formerly Commissioner of Mines of Colorado). Mr. Kimball, of the Old Town, is a graduate of the Colorado School of Mines of the vintage of '88. He is not only manager of the mine, but owns one-third of the stock, so he is rated as one of the wealthy men of Idaho Springs.

There has been an excitement at Ilse, in Custer county, lately. I was down in that country in 1902. The whole Arkansas plateau may be classed as mineral territory. This particular part of it gives every geological evidence of the activities which often result in mineral richness. The old Bull Domingo mine is at Ilse, and is said to have been as rich a body of silver ore as was ever found in the State. There is a lot of volcanic ash around Ilse and frequently one can get a good assay from this material. Another sample from similar stuff taken a few feet away may carry nothing. As I understand it, some rather large bodies of low-grade ore have been discovered. Three assays taken from an open-cut went 80c., $4 and $24 per ton. These assays illustrate the erratic character of the ore.

CRIPPLE CREEK, July 7.

The Cresson mine, on Raven hill, operated by the Bull Hill Mining & Development Co., which became famous last year owing to the large orebody that was discovered on the 600-ft. level, and which produced thousands of tons averaging $25 per ton, has again struck this body on the 700-ft. level. The ore is said to be of better value and of greater width than that on the 600-ft. level. The drift has penetrated the ore for several feet without showing any signs of a wall, so that the size of the orebody is not known.

Becker, Travell & Co.'s lease on the Christmas mine, situated on the southwest slope of Bull hill, is shipping from the 700-ft. level a 30-ton car of ore about every two days. The grade is averaging $25 per ton, the ore being shipped just as it is broken, except for the throwing out of the large lumps of waste rock. An electric hoist is being installed on the 700-ft. level at the Golden Cycle-Christmas boundary, to hoist through an old stope 180 ft. deep. This stope shows ore all the way down on the Christmas side, the Cycle having worked its side out. A drift will be started at the bottom of this stope on the Christmas property, corresponding to the Golden Cycle 800 level, giving 180 ft. of back.

The British American Mining Co., Ltd., a leasing company working the South Dante, has holed through into the North Dante workings. This property is situated between Bull and Raven hills. For some time past the ventilation in the South Dante workings has been very bad, causing a good deal of delay in working, owing to the powder smoke hanging around after blasting. Now that this has been

remedied several promising veins which had previously been cut will be stoped and regular shipments will commence.

Owing to a cave in the tunnel, which carries the boxes conveying the water away from the pumps of the Strong Gold Mining Co. on Battle mountain, pumping operations have been suspended. While this damage is being repaired opportunity will be given for re-timbering the shaft from the 400-ft. level up. The water is gradually rising, cutting off operations on the lower levels. —— Another large ore-shoot has been opened up on the 450-ft. level of the W. P. H. property on Ironclad hill by Beebee & Large, operating through the Jerry Johnson mine. Assays are said to run from two and one-half ounces to nine ounces. This orebody is supposed to be the rich W. P. H. shoot.——A good strike of ore has been made on the south end of the Pharmacist claim on Bull hill at a depth of 50 ft. The vein is thought to be entirely new to the property, and is near that section of the Pharmacist which produced well 15 years ago.

BUTTE, July 7.

The copper output of the Butte district in June amounted to 32,576,700 lb. The following table shows the total ore tonnage and copper production, in pounds, for the entire month, as contributed by the various companies:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	120,000	8,610,000
Anaconda	126,000	8,820,000
Butte & Boston	19,500	1,326,000
Washoe	16,500	1,155,000
Parrot	11,700	713,700
Trenton	16,500	1,089,000
North Butte	27,600	3,588,000
Red Metal	48,000	3,120,000
Original	27,000	2,025,000
East Butte	6,000	600,000
Pittsburgh & Montana	3,750	300,000
Miscellaneous	15,000	1,200,000
Total	437,550	32,576,700

The Red Metal Co. is gradually increasing its output from the old mines operated by United Copper, and has also begun working on the Nipper and other disputed orebodies upon which mining was prohibited during many years. The company's copper production in the next few months will be materially increased. The Parrot Co. is also increasing its output, and the grade is now higher than in May and the early part of June. Clark's Original Co. and the Anaconda Co. are adding to their ore shipments. Other companies represented in the above table have for some time maintained a practically unvarying production.

The new hoisting engine of the North Butte Co., at the Speculator shaft, is now in service. The old machinery hoisted daily between 900 and 950 tons of ore, and now the output is to be increased gradually. In a few weeks the company expects to be hoisting about 1,300 tons daily. The engine is a duplicate of that recently installed by the Boston & Montana Co. at the Leonard mine, and has capacity to work to a depth of 3,500 ft. —— The new engine at the East Butte mine No. 1 has also been completed, and the entire new surface plant is expected to be in operation by July 16. The new shaft being sunk on the Yankee Boy mine has been connected with the raise from the 200 level, and to that depth it is the biggest shaft in the Butte district, and one of the best. That shaft will be connected with the cross-cut being driven from No. 1 shaft. The cross-cut will intercept a vein at a distance of 160 ft. from the shaft. Its length is now about 100 feet.

The Davis-Daly Estates Co. has by accident found another vein on its properties. Men engaged in making an excavation for an electric light and heating plant in the rear of the Butte city hall have cut at a depth of 10 ft. the apex of a vein 30 ft. wide. The vein is on the Smokehouse lode, which will be developed from a shaft to be sunk on the Lizzie claim, situated southeast of the Smokehouse. The Davis-Daly Co. has taken up options it had on the Silver King and Plymouth mines west of the Thomas lode claim, another property of the company. Both the Silver King and Plymouth were for several years closed by injunctions, but the Davis-Daly Co. purchased the interests of the contending parties and will soon resume mining and shipping ore. The Silver King was a producer of rich silver ore a few years ago.——The Reins Copper Co. has cut a small vein near the northern boundary of its mine with the cross-cut from the 1,200-ft. station, and though of little present importance, the company will drive on it.

The Butte & Arizona Copper Co., recently organized in Butte to develop 11 claims in Arizona, 35 miles west of Bisbee, has ordered machinery for the property, which has been shipped from El Paso, Texas. Some high assays have been obtained from near the surface, one sample running 1,600 oz. silver per ton. The ore is mostly copper, the silver occurring near the surface. J. C. Adams, of the Boston & Montana Co. in Butte, and other Butte mining men are interested in the company and made a personal examination of the properties before purchasing them. They have also sent experienced miners from Butte to develop the mines.

The water in the Lexington mines has been lowered to the 600-ft. level and it is expected now that the entire mine will be unwatered in five months more. It had been predicted by mining men that it would take at least a year to drain the mine. The water has been pumped at the rate of 1,800 gal. per minute. Mining men familiar with the Lexington predict that it will, in time, become one of the biggest copper producers in the district. It is yielding now about 150 tons of silver ore per day, with a gross average value of $15 per ton, a figure that is exceeded by only one other mine in the district. The Lexington ore contains about 2.5 to 3% copper. So far this ore has been mined above the 500-ft. level and in the old workings. A new engine has been installed and the output is being increased. The Lexington is owned by F. A. Heinze.

The Columbus-Butte Mining Co. has permitted the Jennie Dell mine, on which the company had an option, to revert to its owners; being unable to raise the $65,000 necessary to lift the bond, all the machinery has been sold by the sheriff and has been purchased by the East Butte Extension Co. The reversion of the lease caused a big loss to the Columbus-Butte stockholders, the majority of whom reside at Columbus, Ohio. —— The new engine of the North Butte Co. at the Speculator mine is in operation and is hoisting 1,000 tons of ore daily. The amount is to be increased by several hundred tons per day. —— The shaft on the Six O'Clock group has reached a depth of 690 ft. A station has been cut at the 600-ft. point, which retarded sinking during June.—— The Butte Consolidated Copper Mining Co., with a capitalization of 600,000 shares at $1 each, has been incorporated by D. D. Twohy, Martin Mulvahill, C. B. McCarthy, Lee M. Ford and T. J. Walsh. The ground controlled by the company lies northeast of Butte.

The Raven Mining Co. has suspended operations entirely and the prospects are that work will not be resumed for a long time. Ostensibly cessation of mining is due to a notice received by the company from the Amalgamated officials that they claim the apex of the Snoozer vein, on which the Raven has been working, is within La Platte mining claim owned by the Anaconda Co., lying just north of the Snoozer. Apparently it is not the intention of the Raven to controvert the contention of the Amalgamated, although the Raven Co. has had the assurance of Amalgamated engineers that there is no doubt that the veins of the Snoozer apex inside the Snoozer lines. The impression in Butte is that the Raven Co.'s property will, in a short time, become an asset of the Butte Coalition Co., which owns a small interest in the Snoozer claim, having acquired it through the purchase of the Heinze interests. It will not be surprising to learn that the Butte Coalition people already own a majority of the Raven stock, and that they acquired it since the stock was hammered down from $8 to 52c. per share. The Snoozer and Raven are good properties, the Snoozer having been opened to a depth of 1,500 ft., where a vein 30 ft. wide was being mined which yielded 10% copper, when the shaft was taken from the company by the Anaconda people, the Snoozer having been worked through the Buffalo shaft of that company. The Raven has a shaft of its own on the Raven claim, which is 700 ft. deep, at which depth the apex of an orebody was cut about a year ago. Since then the company has devoted its work to the Snoozer. Whether the minority stockholders of the Raven will be protected in the deal, or whether the properties will be sold outright by the majority at any valuation they might agree on, is a question for speculation.

SALT LAKE, July 9.

Ore shipments last week from Park City aggregated 2,207 tons, the shippers and amounts being: Daly-Judge, 553 tons; Daly-Judge (zinc middling), 248; Daly-West, 459; Little Bell, 219; Silver King, 589; Kearns-Keith, 72; Jupiter, 36. The Little Bell mine at Park City produced 877 tons of ore in June, from which was realized, after deducting mining, treatment, and transportation charges, $47,827 or $54.50 per ton. The company employs 60 men at the mines. The showing at the New York Bonanza is said to be better than ever. About 25 tons of high-grade ore are ready for shipment.——Jesse Knight, of Provo, has an option on the Steamboat property at the head of Big Cottonwood canyon, near Park City. The ground is to be attached to the Mountain Lake property and will render more economical the development of the latter, in which extensive bodies of ore have been developed.

F. Augustus Heinze has been here several days looking over the smelters and mines of the Bingham Con. Mining & Smelting Co. in company with his chief engineer, Alfred Frank, and E. L. White, president, and Duncan McVichie, general manager of the Bingham Co. The fact has been known for some time that Heinze is now a factor in Bingham Con. affairs, but to what extent has never been made known to the public. However, he is believed to be virtually in control of the proposition, and that the Bingham is to form the nucleus for the formation of a big mining and smelting concern that will form a formidable competitor of existing custom-smelting companies. There is no doubt but that plans are well advanced for the enlargement of the Bingham Con. smelter at Bingham Junction or the building of an entirely new plant. H. L. Charles, an engineer on the staff of Mr. Heinze, has been on the ground for several weeks and is said to favor the building of a new smelter at a point removed from the farming lands of the Salt Lake valley. He is said to favor the site once proposed by a former engineer of the Bingham Co., just below the Dalton & Lark mines at Bingham. Mr. Heinze has looked over this site and, while nothing official has been given out, it is said to meet with his approbation. Mr. Heinze has also made a personal inspection of the Ohio Copper Co.'s mines, which recalls the fact that Mr. Frank recently examined this property, as did also Mr. McVichie; this gives ground for the report that Heinze will soon become, if he is not already, a figure in its operation. The management of the Ohio has stated that its Bingham mine is to be equipped with more powerful machinery and that it is the intention to develop much deeper. Recent investigation has demonstrated that the mineralization extends practically the whole distance between the All's Well and What Cheer fissures, and though the ore is low grade, it can be profitably concentrated.

The Secret Mining & Milling Co., operating at Alta, has purchased the Cole mining claim.——The Con. Flagstaff Mining Co. has filed a copy of articles of incorporation with the Secretary of State and has made an additional payment of $15,000 on its Alta property. William M. Wantland, of Salt Lake, is assistant general manager.——The Overland mill at Sunshine, Tooele county, is in operation, treating 50 tons of ore daily; this has been broken in course of development. It will be several months before the plant will be running at its full capacity.

Directors of the Mammoth Mining Co., operating in Tintic district, have posted a dividend of $20,000 payable this month. Recent development in the east fissure on the 1,300 level has shown gold ore, which was characteristic of the mine in its early history. On the 2,260-ft. level, a cross-cut has cut into a large body of high-grade copper-gold ore.——Men in the employ of Thomas Keeley, of Chicago, and associates, who, several months ago instituted suit against W. A. Clark, owner of the Ophir Hill mine at Ophir, alleging an encroachment on extra-lateral rights and unlawful extraction of ore, have begun their preliminary work. A. Palmer and Newton Dunyon, of Salt Lake, and John W. Finch, of Denver, have been engaged as experts.——A third suit has been filed against the Sacramento Gold Mining Co., Glen R. Bothwell, president, and R. E. McConaughy, secretary, by the Herschell Gold Mining Co., which claims to own two-thirds of the Hazel mining claim. It is alleged that the Sacramento unlawfully extracted ore to the value of $12,500, for which compensation is asked.

The new concentrating mill of the United States Smelting, Refining & Milling Co. at Bingham Junction is now running steadily and treating 100 tons of silver-lead ore from the Old Jordan and Galena mines at Bingham.——Salt Lake banks reported ore and bullion settlements last week to the amount of $455,800. On account of the intervention of a holiday there was a considerable reduction of tonnage of ore sent in. Some of the mines were closed two or three days.

After a conference between officials of the Nevada Con. Copper Co., of Ely, Nevada, it was decided that the first unit of the proposed concentrating mill should be provided with equipment to handle 4,000 tons of ore daily.——The Horn Silver Co. at Frisco, Beaver county, marketed 1,500 tons of ore during June. The zinc mill is still closed, but additional equipment will be added in time, it is said, for resumption of operation in the autumn.

Ore shipments from the Tintic mining district last week aggregated 105 carloads, the shippers and amounts being: Ajax, 2; Beck Tunnel, 6; Black Jack, 8; Bullion-Beck, 7; Carisa, 5; Centennial-Eureka, 28; Dragon-Iron, 9; Eagle & Blue Bell, 6; Eureka Hill, 6; Gemini, 4; Grand Central, 3; May Day, 2; Mammoth 4; Scranton, 4; Sunbeam, 1; Swansea, 4; Uncle Sam, 3; Yankee Con., 3.

CALUMET, July 7.

The Globe Consolidated Copper Co., capitalized for $1,500,000, in 150,000 shares of a par value of $10 each, has been organized at Duluth by Lake Superior mining interests to acquire and develop a tract comprising about 1,000 acres of mineral ground surrounding the Old Dominion and Arizona Commercial mines in the Globe district of Arizona. The new company issued 100,000 shares, $5 each paid, the remaining $5 being subject to call. This will provide $500,000, sufficient to make the first payments on the properties, and provide for extensive exploratory work.

It is understood that Thomas F. Cole, of Duluth, and his associates in Calumet and Pittsburg are not identified with the new corporation. It was organized by Hovland and Smith, who have acted for him in other deals, but are acting in their own interests in the present flotation. Included in the directorate of the new corporation will be H. B. Hovland, H. A. Smith, both of Duluth and prominent in the mining activities in the Bisbee district of Arizona; R. N. Whiteside, J. Uno Sobenius and Louis Reuchleau, all of Duluth, and prominently identified with the United States Steel Corporation's iron-mining interests in the Lake Superior region.

At the time the ground in the Globe district was originally taken under option by Hovland and Smith, it was reported that it was to be turned over to the Calumet & Arizona Mining Co., whose mines are at Bisbee and which has its home office at Calumet. There appears to have been a hitch in the deal, whereupon Hovland and Smith decided to handle the claims themselves. Machinery for the beginning of development has already been ordered. Shafts will be sunk and the ground thoroughly explored by means of cross-cuts and diamond-drills. One-tenth of the purchase price of the properties has already been paid; another tenth will be payable another year from now, and the remaining four-fifths will fall due in June, 1908. By that time the properties should be sufficiently explored to give a good idea of their value as possible copper producers. The new company has secured control of practically all the territory surrounding the developed orebodies in the district.

Indications favor an exceptionally large attendance at the annual meeting of the Lake Superior Mining Institute to be held in the copper country August 8, 9 and 10. The arrangements are being perfected by a committee which has matters well in hand. It is expected that at least 250 members will attend. Special railroad rates will be obtainable from all points in the Lake Superior region, as well as from the larger cities where members reside. The Institute has not held a meeting in the copper country since 1901, so members will find that many important improvements have been made.

Excellent ground is being opened in the bottom of the new No. 4 shaft at the Adventure Con. mine, in Ontonagon county. The showing is the best that has ever been made in the mine. The lode is 35 ft. wide at that point and mineralized from foot to hanging. As the openings become more extensive from the new shaft, it will be possible to increase the production from that source, and there should be a gain in the yield from the property.

BISBEE, July 8.

The work of improving the Calumet & Arizona smelter, at Douglas, is progressing steadily. New bins have been built, affording greatly increased storage capacity for both ore and coke. During the last two weeks large shipments of coke have been received, so that now there is a surplus, for use in an emergency. The new trestle has been completed. The production for the month of June was 3,644,000 lb. copper. At the Calumet & Arizona, the Irish Mag and Oliver shafts have been shipping regularly. A new Nordberg hoist has been installed at the Oliver, and is running satisfactorily. New ore-bins have been built at the Oliver; their total capacity is now about 250 tons. The Sullivan hoist that has been in use at the Irish Mag and Oliver shafts until recently, is now installed at the Briggs shaft, of the Lake Superior & Pittsburg Co. Development work is progressing rapidly. Sinking will soon be resumed. Two large pumps have been installed on the 1,130 level. At the Hoatson shaft the work of installing a new 500-gal. pump is well under way. Stations are being cut, and development work prosecuted vigorously.

Shipments of ore have been made regularly from the Cole shaft; the ore being taken from both the Pittsburg & Duluth and Lake Superior & Pittsburg ground. At the Junction everything is progressing nicely. Development on the several levels is being pushed forward. Sinking has been resumed with encouraging results.——At the American-Saginaw, the situation is the same as usual; the management is planning to substitute oil fuel for coal. At present there is a great scarcity of oil-tank cars, and as soon as this situation is relieved, the plan will be carried out. A pipe-line has been completed, running from the Junction to the Saginaw, through which the oil will be carried.——At the Shattuck driving on the 600, 700 and 800-ft. levels is in progress. The 600 is showing well in oxide and carbonate ore. On the 700, the full face of the drift is in sulphide, which runs over 40 % copper. On the 800 the work is in high-grade ore, carrying native copper. Regular shipments to the Copper Queen smelter will begin about Aug. 1. A new Corliss hoist will arrive this month. Everything is now in readiness to install two new boilers, and the new steel head-frame will be erected early in August. The tramway is being rushed to completion, and the new change-house, for the accommodation of 200 men, will be finished in about a week.——At the Denn-Arizona they are still driving southeast on the 1,000 level. The face of the drift is now about 200 ft. from the drill hole, and is in altered limestone showing carbonate of copper. It is expected that a good orebody will be opened up at any time. Preparations are being made to sink 200 ft. more; the men will probably be in the shaft on Monday. Stations are being cut for two new Prescott pumps (capacity 1,000 gal. per min. each). The flow of water is about 100 gal. per min. which is being taken care of without trouble.——During the past week the shaft at the Warren has been sunk to a depth of 70 ft. The diamond-drill is still boring away; otherwise everything is the same as usual. The June production at the Copper Queen smelter was about 8,000,000 lb. copper.

The new compressor to be installed at the Czar shaft has arrived, and is being placed in position. The old Copper Queen smelter building is being dismantled; as soon as the framework is taken apart it will be removed to the new machine-shop site on the side of Sacramento hill, near the Gardiner shaft.

FOR metallurgical purposes the ores of lead may be divided into the sulphide ores, containing sulphides of the common metals together with galena, and into oxidized ores, called also 'carbonates,' under which term is included, not only lead carbonate or cerrusite proper, but also the very similar-looking sulphates and phosphates of lead.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

Riggs Bros., of Willcox, have bonded their mine, the King of Lead, to Joseph Anderson, Martin King and S. Barron, of Tombstone. The King of Lead is a lead-silver proposition, situated 12 miles northwest of Paradise. It is one of the heaviest producers in the district, having yielded $25,000 in 13 carloads. Assays show an average of 14% lead and 14 oz. silver. The principal working is an adit 425 ft. long.

GRAHAM COUNTY.

(Special Correspondence).—A. Lotichius, of Frankfort, Germany, was a guest of C. E. Mills, superintendent of the Detroit Copper Mining Co. at Morenci, last week. Dr. Lotichius is a member of the firm of H. Lotichius & Co., agents of the Phelps-Dodge interests on the Continent. Before his return to Germany he will visit the various properties of the company in Arizona, and will then visit Colorado and other points. He will be accompanied by his brother, Otto Lotichius, a resident of Clifton.

Following is the result of the drilling contest held here on July 4 and participated in only by miners of this district. The rock used in the contest is a more difficult rock to drill than the Gunnison granite, owing to seams and inequalities that cause the drill to fitcher:

Double-handed.	Inches.	Single-handed.	Inches.
Villegas and Viguerias	43⅝	Buffune	14¼
Mazzotta and Arillia	42¾	Martinez	13¼
Marquez and Seliz	41¼	Garcia	12¾

Time of drilling 15 minutes.

C. D. Clark, who has been in charge of the construction of the new concentrator for the Arizona Copper Co., has resigned and left for a trip through several of the Western States, prior to sailing for London, where he has accepted a position with the engineering firm of Bewick, Moreing & Co. From London he will go to Mandalay, 60 miles from the Chinese line, to take charge of a lead property controlled by the above firm. Cyril Wigmore will succeed Mr. Clark as superintendent of construction at No 6 concentrator of the Arizona Copper Co. Contrary to the reports which have been extensively circulated throughout the Arizona press, there was no strike here on July 1. Everything was quiet. The miners here are mostly Mexicans, and they have made no requests for more pay or shorter hours. The 50-cent cut recently made on employees at the concentrators of the district has been reduced to 25 cents. The new stamp-mill for Depee's gold camp is almost ready for operation.

Clifton, July 9.

Ore shipments from the Shannon mine have been resumed. The fire which destroyed the head-frame at the tramway occurred on June 13. The cable and the cars were destroyed. The new cable was sent to El Paso by express, and ore cars were made at El Paso, and arrived on the same train with the cable. The concentrating plant was closed down for a few days, but the smelter and converting plants were kept in blast. Some concentrate was secured from Cananea, which, with the ore on hand and that received from the New England, was sufficient to keep the plant going.

MOHAVE COUNTY.

The first carload of machinery for the mill on the Cupel mine, at Stockton hill, has reached Kingman. It consists of two hoisting-engines and one mill-engine, their capacity being 26 and 60 h.p. respectively. The other machinery is expected within a few days. This consists of two sets of rolls, two Joplin jigs and one Wilfley concentrating table. The mill will handle 100 tons of ore daily. It will be the largest plant in Wallapai district and is expected to make a finished product of the lead and zinc ore from De la Fountaine mine. Later it will handle the ore of the Cupel mine, of which there are several thousand tons broken in the old stopes and on the dumps. This ore carries silver and lead. The erection of this mill will mark a new era in the treatment of lead and zinc ore in this district, and will show that for years millmen have annually been throwing away thousands of dollars. It is estimated that the ore will net $30 per ton f. o. b. Kingman.

(Special Correspondence).—Considerable attention is being paid to the mining of tungsten ore in this county, and in at least one instance with good results, in a tungsten mine owned by Ed Williams & Co. in Signal district, 45 miles southeast of Kingman. J. A. Carrow and E. T. Staples came up from the mines the past week, where Mr. Staples had been making an examination of the property. This mine has produced a great deal of ore carrying 70% tungstic acid, which sold for $420 per ton at the depot in Kingman. Shipments were made to the Primrose Chemical Co. of Clifton Station, Pa. The work done on the mines has so far been of a superficial character.——A new mining enterprise, which will afford work for additional miners, is at Gold Basin, where an adit has been started on the property of the Arizona & Minnesota Gold Mining Co. to tap the El Dorado vein at a depth of 600 ft. on the dip. If the vein is found valuable at the adit-level a shaft will be sunk to cut the vein several hundred feet below the level.——The Little Chief mine, at Stockton hill, being worked under lease by McMahon & Clark, is again producing. Recently the ore-streak pinched to about two inches, but it was followed down by the lessees and the vein is now about 18 in. wide. The ore assays $500 per ton, the greatest value being in silver, although there is associated with it gold and copper. They have four tons of ore on the dump—the result of five weeks' work.——There is unusual activity in the mines at Mineral Park and a number of good properties are being opened up. At the Keystone rich gold and silver ore is being taken out, and 12 men are at work on the old La Porte mine. At other properties in the district chloriders are at work and doing well. On the summit of the range, north of Stockton hill, Steve Tyler is working several men and getting good results.

Kingman, July 9.

YAVAPAI COUNTY.

Leonard White, who leased the White mine from the White Gold Mining Co., has been overhauling the mill and cleaning out the mine. The mill has been running now for two weeks. The lowest assay from battery sample is said to be $7.85 per ton. The average has been about $10. The mill has been run for 12-hr. shifts only, as there was not sufficient ore blocked out to keep it busy. The mill in the 12-hr. runs has worked 35 tons of ore daily. The most urgent need is a cyanide-plant, for the mill only saves about half the values. The machinery of a good cyanide-plant is on the ground, having been bought by the former management, but it will take time to put it in position, which will be the next thing undertaken by Mr. White. Under the present conditions four men have been able to supply all the ore the mill could crush in 12-hr. runs and two more have been kept on development. The White mine is 11 miles north of Wickenburg.——The Western Queen mine in Turkey Creek district, in the Bradshaw mountains, was worked 30 years ago, when $125,000 was expended in development. At that time there was no wagon road, and the only means of transportation from the mines was by pack animals, and ore worth less than $400 per ton could not be handled at a profit. The miners got off the rich ore at a depth of 30 ft. and followed the hanging wall to a depth of 300 ft. Sweeney and McKenzie, it is reported here, found this lost vein of rich ore, which carries copper, silver and gold. They are sacking 30 tons for shipment, and are making preparations for a hoist and pump.

CALIFORNIA.

ALPINE COUNTY.

Ten thousand inches of water in the east fork of the Carson river, practically the entire flow, have been taken up by the Hercules Mining Co., a corporation composed of the Sparks-Kirman-Humphreys interests of Reno which recently bought the silver and gold mines of Peter Curtz at Loope. J. E. Humphreys, president, says the company will erect a 500-h.p. electric plant and a 40-stamp mill. New buildings are to replace the old structures erected many years ago and a large working force will be employed. The generating plant and mill will be run day and night, and by the first of the year 250 tons of ore will be taken out and reduced daily. The ore is nearly all low grade, but on account of the great quantity of water and timber and the abundant and cheap water-power at hand, it can be reduced cheaply.

AMADOR COUNTY.

A clean-up of the test run on ore from the Wildman mine was made a few days ago. According to local reports the yield was satisfactory, leaving a good margin of profit over all working expenses.——The clean-up of the Gold Top gravel claim at Pine Grove is nearly finished. It is believed it will be sufficient to pay all outstanding claims.——At the Bunker Hill near Amador City, the June clean-up fell a little behind the usual yield, but reached $12,000, using 20 stamps. The need of the company is a new hoist of greater capacity, and the directors are taking steps to that end. The present hoist has answered for the depth of 1,500 feet.

CALAVERAS COUNTY.

A large compressor has been placed at the Red Gold mine near Mokelumne Hill.——The Mokelumne Mining Co. is running a Keystone drill near the Comanche bridge, on the Gooding ranch, with a view to building another gold dredger if the gravel is found rich enough.

EL DORADO COUNTY.

At the Garabaldi mine, a half mile west of Georgetown, men are at work getting the mill in shape to resume operations. Frank J. Littlefield, of San Francisco, one of the owners, is superintending the work.

NEVADA COUNTY.

The Gold Flat Con. Quartz Mining Co. has commenced operations at the Gold Flat mine near Nevada City. It is expected that within 10 days the mine will be clear of water. Joseph Weissbein is president and general manager. William P. Martin of Grass Valley has been appointed underground foreman. As soon as the water is out sinking in the main incline will begin. The intention is to sink 1,000 ft., it now being 370 ft. deep. The incline will follow the vein all the way down. A large new compressor will be installed. The Gold Flat Consolidated embraces a number of claims in one of the richest portions of the district and miners look forward to the development of a paying property. There is a good hoisting and pumping plant on the mine beside a 10-stamp mill. The mill-building is large enough for the installation of 10 more stamps. The last work done on the Gold Flat was by tributers, who took out 600 tons of rock averaging $10 per ton.

SISKIYOU COUNTY.

The Yreka creek dredger has six months' work in the Antone Foster garden to the line of the McNulty ranch, on the Yreka townsite border. After cleaning up the bedrock there, the dredger will probably be moved down the creek to Hawkinsville. The company owns the Miller, Booth and Solus ground and will, it is said, purchase the Perry ranch for mining. The dredger works well, only stopping to shift the boat for new excavations adjoining dug out spots.——U. S. Hicks took out 80 oz. of gold from his quartz claim in China gulch above Hornbrook, in two months, working alone. He crushed the quartz in an arrastra. If it continues to hold out he will put up a mill.——James Ironsides has been sinking 100 ft. on his Little Wonder quartz vein at Cherry Creek and finds high-grade ore.——A valuable copper claim has been located on Old Craggy at Humbug, by J. W. McCann, who is reported to have bonded it to an Eastern company for $100,000 with a 10% cash payment.——The Golden Wonder quartz mine at Cherry Creek, owned by a Los Angeles company, shows rich quartz in the shaft.——Hahn & Ohm are doing well in their vein on Timber gulch in Cherry Creek district.——The Mount Vernon mine at the head of Greenhorn on the Cherry Creek divide, is to be started up again, as the row among the stockholders is in a fair way to settlement.——J. P. Munger, superintendent of the Mono mine, reports a large clean-up from the mine for June.——W. P. Hammond of the Dredger Syndicate, in Butte county, visited the Golden Eagle mine last week, on which property he has a bond. The mill test made by his representative at the mine averaged $2,000 per stamp per month. This mine is on Indian creek.

TEHAMA COUNTY.

The New Bull mines, near Bullychoop, will be developed by a company organized in Redding. The New Bull group is in Tehama county, just across the Shasta line, on Bullychoop mountain. The company is composed of G. Hurst,

president; E. H. McIntire, superintendent, and W. J. Gillespie, W. W. Wheeler and George Endres, directors. The company has secured a bond on the mines and will commence development within 30 days. —— The announcement has been made that the Red Bluff mining district will shortly be formed, and will include the Tom Head country, which is being rapidly located for copper claims. More than 300 acres of mineralized ground has been transferred to the California & Massachusetts Copper Mines Co., and this corporation is said to be surveying the land purchased with a view to applying for patents. Extensive development will be done. The mine is 35 miles west of Red Bluff.

TRINITY COUNTY.

At the Bonanza King mine 175 men are employed in various ways. The lumber for the mill is on the ground and the machinery arriving daily. An aerial tramway, a mile and a half long, is in course of construction. An electric line from the east fork of Trinity river is being erected. The mill and all works will be operated by electricity. The property is owned by the Treadwell brothers of San Francisco.——At Sykes' gravel mine at Trinity Center 30 men are employed day and night. There is plenty of water and a big clean-up is expected.——At Snowslide gulch, near Carville, R. G. Abrams is working a placer mine, the gravel of which prospects well.——The Strode brothers are preparing to start their mill on the Oro Grande mine.——At the Golden Jubilee, on Coffee creek, ten men are taking out ore and the mill is running to its full capacity.——At the Nash gravel mine 15 men are employed. The water supply is good, ground is moving rapidly and the usual clean-up is assured. William Maitland is superintendent.

TUOLUMNE COUNTY.

The Dutch mine in Quartz has been closed down the past month, indirectly because of the San Francisco catastrophe. The company not having the cash to meet the demands of its workmen on the date set for the June pay-day, they declined to work without it. A. Trittenbach, the manager, went to San Francisco a few days after the shut-down. Nothing is yet known in Quartz of the company's intentions. The former employees are desirous of working the property to obtain the wages due them—estimated at $20,000—but have not been able, to date, to arrange satisfactorily to do this.——The Santa Ysabel property on the south end of Quartz mountain has been closed down for two months. When E. C. Loftus took charge of the property, some two and one-half years ago, he did no work in the old shaft, but sank a second incline shaft 300 ft. to the northward which was carried down 800 ft. when operations stopped.——Good progress is reported at the Harvard mine, near Jamestown, since the present company began operations. At the present time 20 stamps are dropping and 10 more will soon be in operation. Additional stamps are being added as fast as the necessary repairs can be made, and soon the 60 stamps will be working. The mill was built six years ago, and the timbers have rotted some since, so concrete is being used in the new foundation for batteries to replace pine. T. J. Russell is foreman. C. E. Shafer is superintendent.

A rich strike is reported in the Jumper mine near Stent, where, once more, good-sized nuggets have been found. Other mines of the vicinity that have been idle are preparing to resume activity. The Jumper had been considered as nearly worked out, but M. D. Kelly, the manager, concluded to sink further, and in 30 ft. one of the biggest strikes in the history of the mine was made.

COLORADO.

BOULDER COUNTY.

Nederland, the tungsten camp, is showing indications of a revival. The unfavorable conditions during the spring months, connected with the depression in the tungsten market, have combined to discourage small operators and limit development. The properties of many of the individual miners are being bought by companies, and hereafter operations will be carried on systematically. The surface ore being nearly exhausted, the prosperity of the district will now depend upon companies with capital. Among the mines that have changed ownership recently is the Bluebird of W. E. McCoy, which was sold for $12,000 to New York parties who expect to erect a mill. The Alton Mining & Milling Co. is running a tunnel to cross-cut the veins of the same system on which the Boulder County mine is working. A 3,000-ft. adit is projected. L. L. Cushman, of New York, is securing options on claims, with the intention supplying ore for a mill to be built near Nederland. More ore will be required to supply the market this year than in any previous year, it is said. Last year Nederland produced $400,000 worth of tungsten, and this year it is expected to pass the million-dollar mark.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Taawasa Gold Mining & Cyanide Co. is building a 200-ton concentrating-mill at its property on the line of the Newhouse tunnel. It is also erecting an aerial tramway connecting mine and mill at Idaho Springs. The machinery is being built by the Davis Iron Works of Denver, and the mill is being erected by the Taawasa Co. J. A. Simmons, president, and T. H. Tracy, general manager of the Taawasa Co., have recently secured control of the Bellows-Hudson group at Empire and will start development work. They will also install a compressor and other machinery. The mill will be automatic throughout and one of the best-equipped plants for handling low-grade material in this county.

Idaho Springs, July 7.

GUNNISON COUNTY.

It is reported that a deal has been closed by which R. P. Russell, of Cripple Creek, secures a three-years' lease on the Vulcan mine. Russell has the contract to mine sulphur, the other ore in the property to remain intact. The lessee will erect a sulphur refinery near the mine, and begin the extraction of the native sulphur. The Vulcan mine is 12 miles south of Iola, on the Rio Grande railroad. Desultory attempts have been made before to mine the sulphur, but without success, owing to the lack of a market. Russell will turn over the output to the Dupont Powder Co. of Denver, which is to build a large powder factory at Sedalia. Pure sulphur sells at $40 per ton, and the grade from the Vulcan mine will bring approximately $32 per ton.

PARK COUNTY.

(Special Correspondence).—J. A Simmons, of New York, and T. H. Tracy, of Denver, have purchased the Holmes group of mines and systematic work is to be commenced on the property. This group is situated on the London fault. The adit is now in 170 ft. and will be continued several hundred feet farther.

Alma, July 7.

SAN JUAN COUNTY.

(Special Correspondence).—The Green Mountain Mining Co.'s mill at Silverton, which was seriously damaged by a snowslide on March 17, has been rebuilt and is again in running order. The reconstructed building is designed by two units of 140-ton capacity each per day, but only one will be operated at present. There is sufficient power to bring the output up to 280 tons when desired. Double 8-hr. shifts will be worked for the present, each shift requiring about 40 men in the mine and 20 in the mill. W. M. Turner, formerly of the Cobra Mining Co., in Cuba, is foreman of the mill, taking the place of D. R. Hickey, who lost his life in the snowslide which demolished the old mill.

Silverton, July 8.

SUMMIT COUNTY.

There are said to be about 1,000 tons of 50% zinc ore in the Country Boy mine on Nigger hill.——The Old Union has shipped 13 cars of zinc concentrate and one car of zinc-lead ore during 10 days in the latter part of June.

The Banner placer, in Iowa gulch, may soon be worked as a quartz mine. In the pit, where the giants have hydraulicked the gravel to bedrock, several large boulders of lead-ore showing gold have been found. It is expected soon to uncover the vein from which this float came.——The Gold Pan will in a few days be running full blast again. Men are now repairing the flume which carries the water round the pit and when this work is completed steady work will commence.

(Special Correspondence).—The Blue Flag Gold Mining Co. is building a 50-ton concentrating mill at the Laurium mine in this district, and installing the Wallace-Owings machinery and Standard tables. The mill was designed by Tatman and Jenkins, of Denver. It is expected to be in operation some time in July. A. R. Miles is superintendent.

Breckenridge, June 29.

TELLER COUNTY.

Joseph Rohrig and associates have taken a lease for the next three months on the City of Cripple Creek mine, situated in the city of Cripple Creek, and will conduct tourists through the property and give them a glimpse of the miners at work. Drifts from the second level will be open to inspection of visitors, the two deeper levels being under water. A machine-drill will be operated for the enlightenment of sightseers.——It is reported that the Copper Queen Mining Co., in the Bare Hills district, 14 miles southwest of Cripple Creek, on the switchback road, has made a strike of copper, silver, gold and molybdenite. At a depth of 140 ft., in an incline, a vein 15 ft. wide carrying 5% copper, $6 gold, 3 oz. silver and some molybdenite has been found. The incorporators of the Copper Queen are J. S. Wagner, manager, Carl Sextus and Waldo Reed. They have a shaft 140 ft. deep, with levels at 50, 100 and 140 ft. and have been working for several months. They propose to sink 200 ft. It is also proposed to install a compressor and machine-drills.

IDAHO.

SHOSHONE COUNTY.

The rock-drilling contest on the afternoon of July 4 at Wallace, in which Patterson and Backland, miners in the Ajax, defeated seven competing teams, was one of the most exciting athletic events ever witnessed in the Coeur d'Alene. ——The two members of a double hand-drilling team alternate between striking and turning the drill. Each team entered works 15 min., and each man's turn at hammering and holding the steel lasts something like a minute. If all goes well, and the men are skilled, not a stroke of the sledge is lost during the 15 min. When the holder's turn to strike comes round he grabs the hammer, which is conveniently placed, leaves the drill free in the hole and both men alternate several blows on the drill head before the striker drops his hammer and seizes the steel in his hands. The changing of steel, which has to be done about 10 times during a contest, is an art, especially after the hole is down a couple of feet and long steel is required. The winning team in this contest met with a peculiar accident. They were working near the 14th minute, when suddenly the granite boulder on which they were drilling split. Quick as a flash the holder of the drill threw away the long steel, grabbed a short one, and in an instant a new hole was being sunk in the remaining portion of the rock. Before the minute had expired the new hole was sunk to a depth of 6 15-32 in. which added to the old hole before the accident brought their total to a 35 ⅝-in. and won the money over the remarkable record made by the first team, Cox and Johns, 35½ in.——The winning and second teams of yesterday's contest have signed articles to compete in another match at Burk, July 16, for $200 per side. Following are the teams in the contest, with the record in inches each team made in 15 min.: Cash Patterson and John Backlund, 35⅝; George Cox and Joe Johns, 35½; E. Baker and James Blythe, 29½; Elmer Sherwood and William Baudry, 31 1-32; S. B. Taylor and E. S. Taylor, 31; A. V. Johnson and Chris Nygren, 31⅛; George Morrison and Edward J. Duff, 31 3-32; Thomas Roberts and Jack Roberts, 33¾.——At Mullan the Federal Co. has broken into ore in the long adit of the Morning mine. It is believed to be the Morning orebody. The strike was made at a depth of 1,500 ft. The adit, which is two miles long, was begun three years ago when Greenough brothers owned the mine.

MICHIGAN

HOUGHTON COUNTY.

It is stated that the sixth level in the Allouez mine, which has been opened for a distance of 200 ft., is in copper rock equal to the average run of the Calumet & Hecla. The rock was considered rich when first encountered, at the first, second and third levels, and when the fourth and fifth levels were opened it was announced that an improvement was noticeable. The sixth level is now said to have ore equal to the Calumet. On July 1 exactly 16 months had passed since copper was first encountered on the Kearsarge lode in the Allouez, and the development during that time has been up to the limit of its capacity. The first level tributary to the Allouez No. 1 shaft is opened to the boundary both north and south, a distance of 475 ft. and about one-third of the vein available has been stoped out. In that portion which has been stoped, not a pound has been left standing because of leanness, the only piece now in place being one small pillar, which was left for safety and which will probably be extracted when the level becomes exhausted. The second level is also opened to the boundary both north and south, a distance of about 600 ft. In this level there is about one-third of the rock extracted and, like the first level, nothing has been left in place because of leanness. The third level is opened to the south boundary and northward for a distance of about 650 ft., leaving about 300 ft. to go before the north boundary is reached. Only a small fraction of the available ground in this level has been stoped. A few spots of low-grade rock have been encountered there. The fourth level is opened for 525 ft., leaving about 650 ft. to go before the boundaries are reached. The fifth level is opened for a distance of 500 ft., leaving 700 ft. to go before the boundaries are reached. In both the fourth and fifth levels only a small part of the available rock has been stoped, that taken from the fifth level being represented by the drift stope driven in development and two small test stopes.

NEVADA.

ELKO COUNTY.

The Protection mine, of Mountain City, on which develvelopment has been in progress more than a year under the supervision of Wm. Willis, is reported to be proving up well. A few days ago a rich strike was made, assays running over $1,000 per ton in gold and silver. The mine is near the Owyhee river, from which power can be had. At Edgemont 80 men are employed in the Burrell mine and mill and regular shipments are made.——In the Aura district the Denver-Nevada Placer Mining Co. has begun work on 2,200 acres of ground on Bull Run basin under the supervision of H. L. Morris. Last fall the company built 5,000 ft. of flume averaging six feet from the ground, and laid 4,000 ft. of pipe and 500 ft. of sluice-boxes. About the head of the basin are a number of producing mines owned by Walker Bros., the Aurora King Gold Mining Co., and others. Three mills are daily handling the ore of these mines, and four others are in course of construction. It is from these veins that the gold was carried into the basin below, on which the Denver-Nevada Placer Co. has begun work.——In Tuscarora 80 men are developing the Dexter and Commonwealth mines. In both of these properties large bodies of high-grade ore have been discovered, which will insure permanency to the camp for years. Each of these mines has produced millions of dollars, although developed to no great extent. The development work which has been in progress for nearly a year has exposed large bodies of ore.

EUREKA COUNTY.

There has been an awakening in the old camp of Eureka, since the United States Smelting, Refining & Mining Co. acquired the Richmond-Eureka lead mines on Ruby hill, comprising an area of over 200 acres. These mines are now being operated and the ore is going to the United States smelter at Bingham Junction, Utah. The mine development is under the direction of A. P. Mayberry and C. E. Allen. In the latter '70s Eureka had 10,000 inhabitants and all of the important mines were working on Ruby hill, Adams hill and Prospect point. Among them were the Eureka Consolidated, Richmond Consolidated and Williamsburg. The increased price of silver and lead has recently had the effect of stimulating Eureka to new life, and the old camp now promises to again become an important centre of production.

LINCOLN COUNTY.

A severe storm and cloudburst caused a washout which delayed trains and flooded the country east of Johnny on July 5. The town of Bowlerville, five miles from Johnny, was completely wrecked.

(Special Correspondence).—A. A. McKnight, representing Chas. M. Schwab, is again visiting Searchlight and El Dorado Canyon in the interest of his principal. The object of his present mission is to close the bonding of the Jake Stoner claims in the canyon. As more time was desired in which to sample the properties, the bond limit was extended to September 15, and it is understood that Mr. Stoner was paid a portion of the large amount for which the mine is held by Schwab. Mr. McKnight is enthusiastic over the possibilities of this district. He also has bonded the Oro Fino group belonging to Vanina & Howe, of Searchlight, whose property adjoins the Stoner claims on the east. The property consists of four claims about two miles southeast of the Techaticup mine. The ore in these mines carries silver. A sample across five feet returned an assay of 980 oz. silver and $11 gold per ton. Specimens of hornsilver are found along the outcrop of the vein, which is prominent for 500 ft. Mr. McKnight is also inspecting properties in the Soda Lake district with a view to bonding or purchasing. ——The Cyrus Noble Extension is returning better results than was expected. With the aid of the recently installed whip the main shaft has reached a depth of 95 ft.; the assays are uniform and satisfactory, the formation resembles that of the original Cyrus Noble which adjoins the Extension on the south. Drifting will be started when the 100-ft. level is reached.——The increasing prosperity of outlying camps has made it necessary for the Searchlight Telegraph & Telephone Co. to extend its lines over many miles of new territory. The new line will start from Johnny siding, whence it will be run to Johnny. From the latter point the line will be built to Parump, thence to Tacopah, and from that point along the line of the T. & T. railroad, returning *via* Sandy, Cima and Leastalk, and connecting with the Copper World, Standard and other prominent mines.——Upon his return from a trip to Los Angeles, John Wheatley, superintendent, increased the force on the Nevada Con. Mines, Ltd., to 24 men and is continuing the sinking of the three shafts commenced before his departure. Shaft No. 1 is down 125 ft., No. 2, 75 ft. and No. 3, 100 ft. The results of this work have induced Mr. Wheatley to double his force. In shaft No. 3 the vein is eight feet wide. Cross-cutting another known vein is in progress at the 100 level of this shaft. This property consists of 20 claims, formerly known as the McGhan-McLaughlin group, which were bought outright last fall for the sum of $250,000.

Searchlight, July 8.

NYE COUNTY.

(Special Correspondence).—W. H. Robinson is said to have struck it rich at Manhattan. While superintendent for the Manhattan Combination Mining Co., Mr. Robinson prospected the claims in the vicinity of his company's holdings and found a vein that looked promising, and, upon prospecting, he found it to contain gold. He said nothing of his find, but quietly induced the owners to part with the property. This was finally arranged and he then began openly to develop his newly acquired holdings. Today he is sacking the ore. His claims are known as the Sentinel and Sunset. The lode is 60 ft. wide, although the pay-shoot of high-grade ore is but five feet wide. This is one of the best strikes made in the Manhattan district. A strong vein has been opened on the El Dorado No. 1 claim of the Manhattan-Nevada, the trend of which is toward the new strike, which is contiguous. Eight hoists are now in operation in Manhattan district and five more are in the course of construction.

(Special Correspondence).—The mine operators of the Tonopah mining district have organized themselves into an association to be known as the Tonopah Mine Operators' Association. The objects of this association are set forth in the following quotation from the Articles of Association: "To advance, promote and protect the interests of the several mine operators of Tonopah mining district belonging to this association, and in general to aid, advance and promote the mining industry of said district; to aid in securing harmonious relations between the several mine operators of said district and their employees; to promote and secure a more complete knowledge and understanding of the relations existing between the several members of this association and its employees, and to secure united, harmonious and co-operative action in relation thereto; to adopt a uniform scale of wages and hours of labor per day for all classes of labor; to aid in discouraging and preventing strikes, lockouts and boycotts in said district, and so far as possible, to promote the amicable settlement of all controversies between employers and employees; to adopt a uniform code of signals to be used at all the hoisting plants operated by the members of this association, and in general to do and perform all lawful acts and things necessary or incidental to the objects and purposes hereinbefore expressed, or which, in the judgment of a majority of the members of this association personally present, may be deemed advisable or advantageous."

The Scale of Wages adopted by the Tonopah Mine Operators' Association, to become operative August 1, 1906, is:

	Hours	Rate
Miners	8	$4.00
Machine-men	8	4.50
Top carmen	8	4.00
Muckers	8	4.00
Ore-sorters	9	4.00 and $5.00
Timber-men	8	4.50
Blacksmiths	9	5.00 and $5.50
Blacksmith-helpers	9	4.00
Carpenters	9	5.50
Engineers	9	5.00
Tool-sharpeners	9	5.00
Electrician-wiremen	9	5.00
Machinists	9	5.00
Machine-miner (Shaft)	8	5.00
Miners (Shaft)	8	4.50
Surface-Laborers	9	4.00

Note: When two rates of wages are given, the higher rate applies to foremen only.

Tonopah, July 7.

(Special Correspondence).—The proposed consolidation of the McNamara and West End mines at Tonopah has been indefinitely postponed because of the objections of the minority stockholders. It is evident that these two adjoining mines could be more economically worked with one centralized office staff than with two. But, fearing that they might be 'frozen out,' the smaller interests prefer the present unwieldy arrangement. Mark B. Kerr will continue as manager of the West End mine and Fred Corkill will take charge of the McNamara.

Tonopah, July 10.

NEW MEXICO.

TAOS COUNTY.

Macedonia, Torres & Co. has shipped two six-horse loads of ore from its mine at Crooks, near Tres Piedras. —— The Blake Mining & Milling Co., of Las Vegas, is reported to have received an order for 2,000 tons of copper. —— A small force is enlarging the main shaft of the Kuykendall Mining & Milling Co. in the Guadalupe mountains. Machinery for the mine is on the road. The mine and mill are to be enclosed by a high stockade.

COLFAX COUNTY.

The Gold & Copper Deep Tunnel Mining Co., operating on the west side of Old Baldy, has its adit in 2,000 ft. and has encountered a number of rich stringers of ore, but will continue to drive the adit 3,500 ft. The company is composed of Las Vegas, Trinidad and Raton men.

SANDOVAL COUNTY.

Preparations are being made for the resumption of work on several properties at Bland. The Peralta Gold Mining & Milling Co. is among them. Its stockholders met recently in Peralta canyon to go over the ground in person. The company's property has been idle since 1900. The Navajo Co. is also figuring on early resumption.

OREGON.

BAKER COUNTY.

The Iron Dyke copper mine, on the Snake river, has been sold to the Erie Trust Co. of Erie, Pa., under deed of trust and bond. The Erie Trust Co. holds the property in trust for the Iron Dyke Copper Mining Co., which is to continue extracting ore, building concentrating plants, railroads, etc., and to develop the property until the profits have redeemed the bonds and stock mentioned in the consideration.

JOSEPHINE COUNTY.

C. L. Kenny, superintendent of the Eureka mine at Briggs, says the mine is in good shape now, he having re-timbered the workings. The 10-stamp mill was put in order, and last week it was run for three days on a test and to ascertain if the engines and other machinery were in good condition. For some time only development work will be done to get the mine in shape for steady production. E. T. McKinstry of Grants Pass is in charge of underground work.

UTAH.

SALT LAKE COUNTY.

It is reported that Joseph J. Bamberger, representing O. F. Jonasson & Co., of New York, and acting through them for F. Kneeland, John P. Stone and F. W. Davis, of New York, has closed a deal for the Alta mining property. For the control of five claims adjoining the Columbus Consolidated on the northwest, he paid to Tony Jacobson and A. O. Jacobson, owners of the property, $40,000. He was prepared to take the entire property, but the owners would not sell it all, preferring to retain an interest and take part in its development. The property purchased consists of the Silver Dipper, Alexander No. 1 and 2 and Le Roy No. 1 and No. 2 lode claims, embracing approximately 100 acres. Negotiations have been pending for some time after the ground had been examined and reported upon by local engineers and experts from the East. Ore has been shipped that has netted, according to smelter returns, $110 per ton. The new company will be known as the West Columbus.

WYOMING.

UINTA COUNTY.

A rich strike of gold ore is reported from Thayne, near Afton. Claims are being staked rapidly and a stampede has begun. It is reported that, while working in an irrigation ditch on the Marion Heap ranch, the men struck a cement bed which it was found necessary to blast in order that the construction of the canal might proceed. In clearing away the dirt after the blast, the men picked up numerous small nuggets of gold the size of wheat kernels and one or two even larger.

CANADA.

BRITISH COLUMBIA.

Following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending July 7 and for the year to date:

Centre Star	1,776	75,810
Le Roi	2,520	65,600
Le Roi No. 2	450	13,910
Le Roi No 2 (milled)	1,200	9,000
Jumbo	.....	2,600
O. K. (milled)	.....	65
Mabel	.....	25
Crown Point	.....	355
Total	5,946	167,365

On account of Dominion Day celebration ore shipments and treatment in the Boundary were light last week, the Dominion smelter being the only works not closed. Following are the figures for the week ending July 7: To Granby smelter, from Granby mines, 9,266 tons; from Emma, 101 tons. To British Columbia Copper smelter: From Mother Lode, 192 tons. To Dominion Copper Co. smelter: From Brooklyn Stemwinder, 1,551 tons; from Sunset, 495 tons; from Mountain Rose, 42 tons. To Nelson smelter: From Emma, 44 tons. Total weekly shipments, 11,691 tons. Total shipments for year, 640,305 tons. Boundary smelters treated this week: Granby smelter, 8,575 tons; Dominion Copper Co. smelter, 2,088 tons. Total for week 10,663 tons. Treatment for year to date, 646,173 tons.

In the Lardeau, the Silver Dollar Co. is building an aerial tramway. The right of way has been cleared, and the contract awarded. The concrete foundation for the compressor is about completed and the framework for the stamp-mill is being erected. The flume has been constructed to within a short distance of the mill, and another week will see this work completed. Machinery for the mill is being taken up, and the trail is being widened so that the largest pieces may be safely transported.

A strike has been reported on the 200-ft. level of the Dunlea mine on Ten Mile, just above Slocan City. The ore is rich in silver and lead.——Work has been started preparing foundations for the new compressor for La Plata mine.

A mine, said to be rich in molybdenum, has been found 50 miles northwest from Pitt lake, and about the same distance from Vancouver. A company of Americans has been developing this mine and has an order for 200 tons, to be shipped to London on trial. Access is difficult. Machinery is to be taken in and set up as soon as a road can be completed over which it can be transported.

The nine-hour day has been inaugurated at the Granby mines for all work done on the surface, where ten hours has been the rule heretofore. This will include blacksmiths, machinists, carpenters, teamsters and all except underground men, where eight hours is the custom and the law. Some months ago a request was made for the nine-hour day, and Mr. Hodges, superintendent, after conferring with Mr. J. Langeloth, the president of the company, on his recent trip to Phoenix decided to put the nine-hour day into effect. The Dominion Copper Co. has also adopted the nine-hour day for above-ground workers, beginning with July. The other mines at Phoenix camp will soon be on this basis. Previous to 1899 all the mines of the Province worked ten hours, both above and below ground, except where three shifts were employed. That year the eight-hour law for underground miners came into force, but did not affect those working above ground. The eight-hour law went into effect in the Boundary without friction, just as the nine-hour rule is doing in Phoenix now. The superintendent of the Granby Consolidated announces that work will be prosecuted steadily on the new $100,000 three-compartment shaft. For some time past two diamond-drills have been boring in many places to determine the best place to sink this permanent working shaft, and last week a force was started clearing the site. The work of raising from the 400 and 300-ft. levels has been begun, and these raises when connected and put through to the surface, will form a portion of the main shaft. In a few days the sinking from the surface will be undertaken. The following were the shipments from Boundary mines during the week ending June 30: Granby mines of Phoenix, 18,919 tons; Brooklyn Stemwinder of Phoenix, 3,366; Rawhide of Phoenix, 528; Sunset of Deadwood, 1,155; Mountain Rose of Summit, 70; Emma of Summit, 264; Providence of Providence, 60; Skylark of Skylark, 20. Total tons, 24,382. The smelters treated ore as follows: Granby Co., 17,982; Dominion Copper Co., 5,119. Total 23,101.

The shipments of ore from the Rossland mines during the first six months of this year amounted to 161,419 tons, and should the same ratio be kept up the output for the year will be 322,838 tons, against 321,464 tons for 1905, which was valued at $3,545,132. It will be seen from these figures that the yield this year will be approximately the same as it was in 1905. Last year there were 14 shippers, and this year there are eight, so far, but the number may be increased before the end of the year. Matters are shaping themselves at some of the leading mines so that it is probable that the yield may be largely increased.——The following is the tonnage of ore shipped from and crushed at the mines of Rossland for the week ending June 30, and for the year to date:

Centre Star	2,580	74,034
Le Roi	2,730	63,080
Le Roi No. 2	300	13,460
Le Roi No. 2 (milled)	.....	7,800
Jumbo	.....	2,600
O. K. (milled)	.....	65
Mabel	.....	25
Crown Point	30	355
Total	5,640	161,419

At the Centre Star, the compressor building is almost all closed in and will soon be finished. The development of the lower level goes on steadily, and connections between the Centre Star and War Eagle are being made. In Le Roi mine, the deepening of the winze below the 1,600-ft. level should make good progress during the next week, as all the preliminary work is about completed. Work on the crosscuts above the 1,650-ft. level, which are being run to tap the ore-shoots west of the dike, is being pushed. At Le Roi No. 2 there is no extraordinary development to note. The Velvet-Portland has closed down by order of the local management. The cause was a shortage of funds, but it is probable that the embarrassment was of a temporary character, and that when matters can be re-adjusted work will be resumed. One carload of ore was sent from the Crown Point during the past week. Early in the week the property was closed down. It is likely that diamond-drill explorations will be undertaken to find the lode, which was cut off by a fault. Work continues on the White Bear, mainly on the 80-ft. level. There is nothing new to report, except that the development work is being pushed. Reports from the Inland Empire continue to be of an encouraging character. The sinking of the shaft between the surface and the face of the adit, to a junction with the shaft below the adit-level, continues

Personals.

J. POWER HUTCHINS is at Denver.

R. GILMAN BROWN is at Grass Valley.

F. W. BRADLEY has gone to Wardner, Idaho.

W. M. CLARK is now at Ansonia, Connecticut.

S. B. NEWALL is visiting London from Mexico.

E. B. GAGE, of Tombstone, is at Hotel Majestic, San Francisco.

W. J. ADAMS has returned to San Francisco from Grass Valley.

CHARLES JANIN has returned to San Francisco from London.

ARTHUR W. PETERSON, of Tonopah, is on a visit to San Francisco.

ROBERT LANKA has gone to visit mining camps in northern Nevada.

SEELEY W. MUDD has returned from New York and is in San Francisco.

EDWARD L. DUFOURCQ has returned to New York from Sonora, Mexico.

BERTRAM HUNT has returned from Nevada and left on Tuesday for Glasgow.

ALFRED JAMES sails on the *Coronia* for London, leaving New York on July 17.

FRANK V. DRAKE is exploring in the White mountains of Inyo county, California.

J. H. CURLE arrived at Seattle from Japan on July 7; he is now at Houghton, Michigan.

PERCY L. FEARN was in Denver on July 7, returning from a trip to Montana and Colorado.

H. R. SLEEMAN has taken the management of the Whim Well copper mines in Western Australia.

WILLIAM M. WAUTLAND is assistant general manager of the Flagstaff Consolidated Mining Co., at Alta, Utah.

F. J. LITTLEFIELD is at Georgetown, Cal., superintending the resumption of operations at the Garibaldi mine.

DANIEL GUGGENHEIM and party have postponed the contemplated inspection of the Copper River mines, in Alaska.

H. E. WEST has been appointed assistant engineer to the Spassky copper mine, at Spasski Zavod, near Akmolinsk, Siberia.

WILLIAM W. MEIN, manager of the Robinson mine, is on a visit to London from Johannesburg. He is on his way to San Francisco.

FRANK G. STEVENS, general manager of the San Pablo Mining Co., is also to take charge of El Favor mines, near Guadalajara, Mexico.

JAMES F. KEMP, professor of geology in Columbia University, has received the honorary degree of D. Sc. from his alma mater, Amherst College.

R. W. RAYMOND, THEODORE DWIGHT and many other members of the American Institute of Mining Engineers sailed for London on the *Celtic*, leaving New York on July 13.

D. COLE, until recently superintendent of the concentrator, has been appointed general manager of the Greene Consolidated Copper Co., at Cananea, succeeding ARTHUR S. DWIGHT, who has resigned, as already stated.

C. D. CLARK, of Clifton, Ariz., has accepted a position with Bewick, Moreing & Co., going to Mandalay, Burma. He was in charge of construction of the new concentrator of the Arizona Copper Co., in which position he has been succeeded by CYRIL WIGMORE.

J. J. MULTER has been appointed manager of the Napa Consolidated Quicksilver mines, at Oat Hill, Napa county, Cal., succeeding B. M. NEWCOMB, who has filled this position for twenty years, and will continue to direct the operating of the property as general superintendent. Mr. Newcomb is also general superintendent of the New Idria Quicksilver Mining Co., having had charge in this capacity since 1895.

Commercial Paragraphs.

THE Salt Lake City district office of the Westinghouse Electric & Mfg. Co. was removed July 2 to 212-214 South West Temple St. The Dallas district office was also removed on the same date to 418 Main St., Dallas, Texas.

A. A. TALMAGE, secretary and manager of the Blaisdell Company, of Los Angeles, severed his connection with said company on July 1, to become associated with The Securities Corporation, Ltd., at 40 Wall street, New York.

THE HENDRIE & BOLTHOFF MANUFACTURING & SUPPLY CO., of Denver, Colorado, announce that they are now sole Western agents for Root & Barron's elastic roof cement, and carry a large stock from which they can make prompt shipments to all Western points.

THE new stamp-mill machinery for the Camp Bird mine, at Ouray, Colorado, has been purchased from the ALLIS-CHALMERS CO., of Milwaukee; it consists of approximately 180 tons of stamp-mill and frue-vanning machinery. The new plant will include six 5-ton anvil blocks, 21 in. high, and eight mortars for 1,050-lb. stamps. There were also ordered thirty 6-ft. standard frue-vanning machines complete.

CROCKER-WHEELER CO., of Ampere, N. J., reports among their recent sales the following machines: Twenty-one direct-current motors ranging from 6 to 75 h.p., sold to the National Tube Co., of McKeesport, Pa.; one 500-kw. D. C. generator to Pensacola Electrical Terminal R. R. Co., of Pensacola, Fla.; 100-kw. A. C. engine-type generator, 3-phase, 60-cycle, 240-volt, and 6½-h.p. exciter, 125 volts, to the American Multigraph Co. of Cleveland, Ohio, to furnish power for the motors and lights in their new factory at Cleveland; one 75-h.p. 115-volt D. C. motor to the N. J. Zinc Co., Franklin Junction, N. J.

AN interesting installation about to be made in Peru is at the mines of the Inca Mining Co. All material has to be packed up the mountain trails on mules. The electrical equipment includes a General Electric three-phase 200-kw. 6,600-volt alternating current generator of the revolving field type. In addition there will be four 67-kw. transformers as well as several induction motors for hoisting work and the necessary switchboards. The complete equipment will be furnished by the GENERAL ELECTRIC COMPANY. In order to facilitate transportation all the apparatus will be constructed in parts, none of which will weigh over 350 lb. except the alternator shaft. The work of assembling the machinery will be done at the mines.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

New York, Boston and London, July 12.

Anaconda	$227	North Butte	$ 83¾
Bingham	26	U. S. Mining	54
Calumet & Hecla	685	Utah Copper	52½
Copper Range	67¾	Wolverine	138
Daly West	15½	Rand Mines	£ 5⅝
Granby	9½	De Beers	£17¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 5. £ s. d.	July 12. £ s. d.
Camp Bird	1 4 0	1 4 6
El Oro	1 5 0	1 5 7½
Esperanza	3 18 9	3 18 1½
Dolores	2 5 0	2 0 0
Oroville Dredging	0 17 6	0 17 6
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 5 7½	1 6 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending July 5.	Average Prices for Week Ending July 12.
Lake	$18.55@18.75	$18.50@18.70
Electrolytic	18.15@18.40	18.05@18.30
Casting	18.00@18.12	17.87@18.00
Lead	5.75	5.75
Spelter	6.00	5.97@ 6.00
Silver	0.64⅝	0.65⅛

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

GYPSUM is soluble in 500 parts of water and completely soluble in boiling hydrochloric acid.

THE paint known as Griffith zinc-white is made by combining zinc sulphide, zinc oxide and barium sulphate in oil.

SCHEELITE (calcium tungstate) is soluble in either nitric or hydrochloric acid, leaving a yellow residue, which is soluble in ammonia.

HEAVY SPAR (barium sulphate) is sometimes used as a pigment, and often as an adulterant of white-lead. For these purposes it is finely ground by levigation and dried.

GOLD POWDER or bronzé is made by grinding gold leaf in a mortar with honey, extracting the honey with hot water and drying the powder. It is used in illumination and miniature painting.

THE crystalline condition of gypsum has no relation to its usefulness. Selenite, the transparent variety; satin spar, the fibrous variety; and alabaster, the earthy amorphous kind, are chemically the same.

THE advance of mankind has everywhere depended on the production of men of genius; and that production is a case of 'spontaneous variation' becoming hereditary, not by physical propagation, but by the help of language, letters and the printing press.

THE alloy of gold with mercury is known as its 'amalgam.' Mercury alloys with gold with great avidity, this being due not only to the marked affinity of the metals, but also to the fact that mercury is a metal which exists in the molten state at an ordinary temperature.

CHRYSOCOLLA is a valuable, though not abundant, ore of copper. It is easily reduced in the furnace in the presence of a strong base—such as ferrous oxide or lime—by the carbon of the fuel, to metallic copper. When heated with sulphide of iron, copper-matte and iron silicate are formed, and when heated with metallic iron, iron silicate and metallic copper result.

LYELL'S fundamental proposition, which revolutionized the study of geology, was that no causes whatever have, from the earliest time to which we can look back, to the present, ever acted but those now acting; and that they never acted with different degrees of energy from that which they now exert. This extreme interpretation of uniformity in kind and degree has been modified by later geologists.

THE amount of steam that may be made with coal depends upon the coal itself, and also upon the conditions under which it is burned. Another important factor is the man who is doing the firing. An inexperienced man can easily waste coal by either too little or too much stoking. Overfeeding the fire results in intense heat, causing waste by blowing off of the safety valve. When fuel is again added to the fire in unnecessarily large amount it temporarily deadens the fire and the steam goes down, only to rise again when the fire burns brightly. Coal making a large percentage of ash is not so good as that making less.

THE very high price of some of the Comstock mining shares in the early history of the lode—as high as $4,000—was due to the limited number of shares in the corporation, each share representing a linear foot of the claim along the line of the lode. As the exorbitant price of some of the stocks placed them beyond the reach of all except the wealthy, the controlling powers conceived the happy idea of 'watering' the stock—creating a large number of shares, each having a value which would come within the easy reach of all who were disposed to speculate, but some of the stocks required repeated applications of 'water' to keep them down to the possibilities of the over-eager investors.

BY the laws adopted in 1859 by the miners of Gregory district, Gilpin county, Colorado, it was enacted: (1.) That no miner should hold more than one claim, except by purchase or discovery. (2.) That each miner should be entitled to one mountain claim 100 ft. long by 50 ft. wide; one gulch claim 100 ft. up and down the river or gulch and extending from bank to bank; and one creek claim for the purpose of washing. Time proved that the 'mountain claims' were none too large for the surface work, and entirely too small for deep mining. The small size of these original quartz claims proved a serious hindrance in the development of the district. Subsequently it was enacted by United States Statute that the legal size of quartz claims be 150 ft. wide and 1,500 ft. long.

AT Mokelumne Hill, Calaveras Co., Cal., the ancient river channels, lying beneath the lava beds in that district, were found astonishingly rich, and the demand for claims resulted in a local law being passed by the miners, making placer claims 16 ft. square. The un-wisdom of this action promptly became apparent, for Stockton hill, an eminence within the town limits of Mokelumne Hill, was quickly divided into claims of the size prescribed by the miner's law; but within a few days many of the claim owners were engaged in sanguinary conflict, as they found they could not mine without interfering with each other's operations. While some continued to brawl and fight, others wisely consolidated their interests and proceeded to sink through the lava cap to bedrock. Some of these shafts were more than 250 ft. deep, sunk without timbers, and are open still today, after 50 years. A reminder of those early days may be seen in the numerous white dumps crowding each other on the northeast slope of Stockton hill, suggesting the homes of coyotes or other burrowing animals.

THE first piece of gold found in California by James W. Marshall weighed 50c. and the second $5. They were paid out for provisions and all trace of them lost. The discovery of the first specimen of gold remarkable for its extraordinary size plays a prominent part in the early history of California. The official news of the discovery of gold in that State was taken to the Government by General E. F. Beale. He went to Washington, bearing about $50 worth of gold-dust, but he failed to excite the interest he anticipated and returned disappointed. During his absence the historical mad rush to California from the ends of the earth had begun and he found San Francisco in a state of wild excitement. He arrived late in the summer of 1848. About that time a young soldier of Stevenson's regiment, while riding along the Mokelumne river, stopped to drink from a stream and discovered a gold nugget, weighing between 20 and 25 lb. He hastened to San Francisco and placed his prize in the hands of Col. Mason for safety, who sent it by General Beale to the Eastern States, the exhibition of which in New York fanned the smouldering flame, and the nation began to realize the importance of newly acquired California.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Mining Method Wanted.

The Editor:

Sir—The problem submitted by 'New Superintendent' and answered by 'Prospector' is very interesting to me, as for six years I was foreman of a low-grade mine in which the vein has about the same pitch as that described by New Superintendent, and struggled with all the difficulties incidental to winning profits from a low-grade, flat vein; but in our case matters were further complicated by unusually bad ground, not only the vein itself, but the walls also being very heavy. As Prospector says, "The best mining method cannot always be arbitrarily decided upon prior to trial. Satisfactory methods are usually the result of experiment and evolution."

In the case submitted by New Superintendent the vein is much larger than that of the mine of which I had charge, but the following plan is respectfully submitted, as it is the same general plan of working the stopes that proved satisfactory in the case cited, though the vein averaged from 12 to 15 ft. in thickness. It is the plan that would suggest itself to me from the experience gained in working the other vein, as, it may be added, the mine thus operated was a financial success. The salient points in this case, as they appear to me, are as follows: The vein is 50 ft. thick, pitches at 23 degrees, stands well without timbers and has a good hanging wall. An adit has been driven from the surface, tapping the vein 600 ft. from the apex and cross-cutting it from foot to hanging. Nothing is said about the length of the orebody, but it is evidently safe to assume that it is considerable. Reference is now made to the diagram (Fig. 1), illustrating the plan proposed. From point A (the intersection of the adit and the vein), drifts should be run in the foot-wall just under the vein, both ways, and from point A a raise started and run up to the hanging wall at an angle of, say, 55 degrees, the point of intersection being indicated in the diagram by the letter B. Returning to point A, a good chute should be put in of two compartments, the ore compartment should be 6 by 6 ft. or 6 by 8 ft. and there should be a good-sized manway 4 by 6 ft., as for the present all tools, cars, rails, timbers, pipe, etc., must pass up through it to the stope. A good roomy station should be put in at point A, and as soon as this is done, stoping at point A may begin, starting each floor from the raise until the block of ground indicated by the triangle, A B D is worked out, the ore passing through the chute at point A and thence in cars through the adit to the surface. When the foot-wall drifts have advanced 60 ft. from point A, raises should be put up to the hanging wall similar to raise A B and chutes put in similar to that at A, and stoping commenced. These chutes, 60 ft. apart, can be put in the entire length of the orebody. As stoping progresses the stopes will hole through to each other until the breast is open the entire length of the orebody. When stoping begins at the different chutes, a crib-chute should be carried up in each case of 10 or 12 in. rough round timbers, keeping the two compartments the same size as the chute was started, filling the stope with the broken ore around the chutes and drawing the surplus ore out through the chute. From point A another raise should be started to run up on the foot-wall, in the orebody to the surface 600 ft., which we will call the main raise. It will cost money, but it will be indispensable and a raise can be put up at much less expense than a shaft sunk. This connection will insure an abundant supply of fresh air to the stopes; it will be handy to run the pipes through, and convenient to get tools and timbers down, besides affording a passage-way. It should be carried up in the vein, keeping in touch with the foot-wall the entire distance, and the ore coming therefrom dumped into the chute at point A.

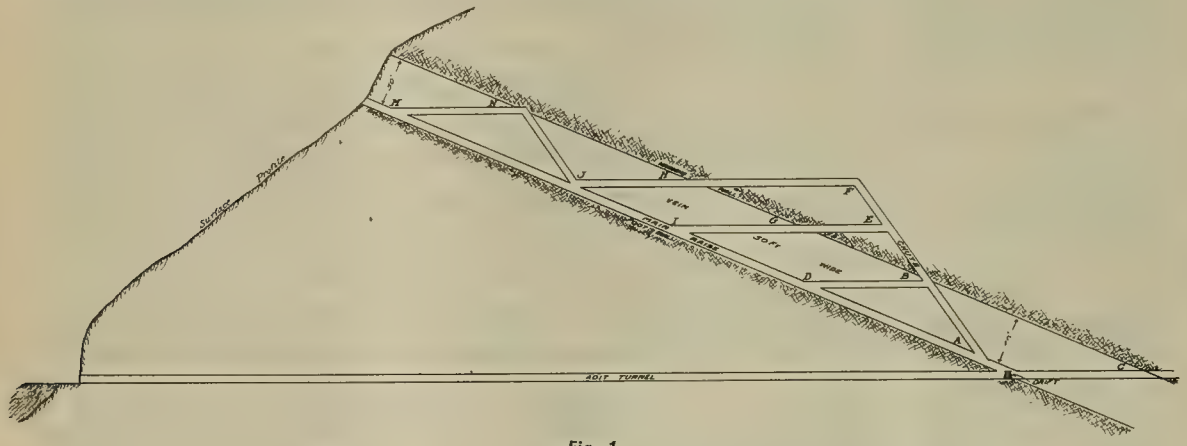


Fig. 1.

The greatest problem in connection with the mining of a raise up a flat foot-wall is the handling of the waste and a scheme will be explained later on, which was successfully used in the mine first cited, whereby the waste can be got rid of at little more expense than in a drift. We will now suppose that the stope represented by the triangle A B D has been worked out and the chute cribbed up through the ore. This ore can be run out by removing the upper crib-sets one at a time and raking the ore into the chute. After the ore is out, the stope must be filled with waste, most of which is obtained by continuing the raise A B into the hanging wall from point B to point F at the same angle at which it started—55 degrees—and running the cross-cuts E G and F H from this raise back to the vein. The waste from the raise and cross-cuts is dumped into the stoped-out ground, represented by the triangle A B D; and as the stope fills with the waste the crib-chute is again carried up from point A to point B, and is then permanently in place. Regarding the main raise, sets can be put in and the waste filled around them or the foot-wall can be blasted and the waste put into the fill, A B D, leaving the entire raise in the foot-wall and timbering the back of the raise with poles laid at right angles to the raise and resting on the foot-wall. If sufficient waste has not been obtained to fill the stope, it should be filled by running a raise for waste into the hanging wall. All the other stopes from the foot-wall drifts should be opened, worked, and filled in similar manner,

except that they will not be bothered by the main raise. The stope A B D having been worked out and filled, stoping operations can be resumed at point B and the block of ground represented by B D G can be attacked. As the work progresses, tracks are laid in the level B D running to different parts of the stope and the ore dumped into the chute A B, which now being about 100 ft. long will hold an ore reserve, when full, of about 250 tons. It will be readily seen that stopes B D G and D G I, above drift B D, can be worked and the ore dumped into chute A B. All the other stopes above the stope-drifts, similar to B D, are worked in the same manner and the ore trammed into their respective chutes on the main level, and the stopes filled by running raises into the hanging wall where sufficient waste has not been obtained by drifts and raises.

In the practical working of a large orebody like this, so much of the detail work depends upon the conditions, as they are found to exist, that no previously determined plan can be followed except in a general way. For instance, it would probably be found expedient to continue the drifts B B, G I, and H T into the foot-wall a short distance, to get the upper part of stopes D G I and I H T. Again, it may be found that a perpendicular distance of 50 ft. between the levels is too great, in which case an intermediate level in the stope can be carried, making a perpendicular distance of 25 ft. between the stope-levels. All the other stopes above are worked in similar manner, tramming the ore through the hanging-wall cross-cuts F G and F H into the chute A T, which, when full, hold an ore reserve of 500 tons. The bottom of these chutes should be floored with two-inch plank and lined with ¼-in. sheet-iron three feet wide and a light chain should be suspended from top to bottom, as the great weight of the ore in them is sure to pack at times and cause trouble, expense, and danger in loosening. It will be seen that by following the foregoing plan the ore can be delivered to the chutes by mucking once, and the only deadwork required (the hanging-wall raises and cross-cuts) will furnish waste to fill the worked-out stopes, the track in the stopes not being put in till the ground is stoped ahead. By opening the mine in this manner, a practically unlimited quantity of ore will be available at once and the mill can be started in a very short time.

Reference was made in the foregoing to a plan of handling waste in the raise. The raise should be 10 ft.



wide by 7 ft. high. Two self-dumping cars are used, two tracks and two ⅝-in. steel cables. The drum is illustrated herewith. A stick of timber, about 6 ft. long and 14 in. thick is turned down to about 10 in. for the drums, leaving a shoulder at each end and about a foot of the centre for the brake, at the full size of the stick. In the instance quoted the brake was a piece of inch rope, four or five turns being taken around the stick. Spindles of inch iron were used, as illustrated. The device was placed in position by drilling two holes in the back of the raise about two feet deep and placing two by two-inch steel-bars three feet long in these holes. The bars were wedged tightly in the holes by wooden wedges and then long steel wedges driven alongside of those of wood so the bars could be taken out whenever desired, by knocking out the steel wedges. At the ends of these bars, called 'hangers,' boxes were made to fit the spindles of the drum. When the machines were drilling in the face of the raise, two holes would be drilled into the back of the raise about six feet apart and about 25 ft. from where the drum was last placed to accommodate the hangers, and two other holes were drilled into the back for the brake; as it will be seen, it is necessary to make fast both ends of the brake-rope, because the drum revolves in opposite directions for each car. These four holes, two for the hangers and two for the brake-rope, are drilled every 25 ft. apart at each loading station in the raise One of the boxes in the hangers can be easily removed and just prior to blasting, the box is released and the drum taken down and put in a place of safety, the ore-car on the track being blocked in the meantime. A good shoveling platform should be put in at each of these stations, and the drum and ropes being overhead, there is nothing to prevent the shovelers from filling the cars. Rollers should be placed on the tracks about 25 ft. apart. At the lower end of the track at the chute, the last three feet of the T rail should pitch at an angle of about 50 degrees and the extreme end of the rail should be set back to fit the circumference of the car-wheel, to act as a bumper and hold the car in place in the chute. Any simple device can be used to open the car door automatically; a good one is to have a post between the two tracks and a piece of iron bolted on it at such an angle that it will lift a side latch on each car-door and allow the door to open as it goes over into the chute. I see no reason why this device could not be used in running the main raise in the foregoing plan, except as the distance is greater it would probably be better to make a better drum of iron with a good brake, in fact to make a good strong rig, but not too large to hang overhead, as the great advantage is gained by having room to work under it.

R. B. NICKERSON.

Berkeley, June 26, 1906.

Corrosion of Steel vs. Iron.

The National Tube Company, Pittsburg, Pa., has recently developed spellerized steel for the manufacture of tubular goods. It is now using this material in the manufacture of boiler tubes. Henry M. Howe, professor of metallurgy, Columbia University, New York, has just completed one set of tests of this steel against charcoal iron and common iron. His report follows:

Material.....	Plate No.....	Loss of weight. Grams per sq. in. of surface.	Maximum loss. Minimum loss.		Av. loss. Grams per sq. in.....	Per cent excess average corrosion W. I. over average corrosion steel.....
Steel.....	C 4	0.0692			0.0576	
	C C 0	0.0611				
	C C C 5	0.0538	Max. 0.0692			
	C 1	0.0510				
	C 2	0.0633	Min. 0.0484			
	16	0.0492				
	y 17	0.0645				
	x 18	0.0484				14.6
Charcoal iron.	C D 13	0.0745		Av. loss charcoal iron.		
	C D 14	0.0625		0.0666		
	C D 15	0.0629				
	D 11	0.0577	Max. 0.0864	Av. loss muck bar.		
	D 12	0.0864				
Muck bar.	D D 6	0.0563	Min. 0.0559	0.0657	0.0660	
	D 9	0.0641				
	D D D 7	0.0692				
	D D D D 8	0.0559				
	D D 10	0.0701				

This steel seems to corrode evenly and not to be subject to pitting, making it especially desirable for locomotive and stationary boilers where bad water is used.

MANY mines in Colorado which do not produce ore sufficiently rich to afford a profit by shipping to smelters; have in recent years been equipped with concentrators and are now treating more ore than formerly and sending the concentrate to the smelters.

MICA-SCHIST, HORNBLENDE-SCHIST, CLAY-SLATE AND MICA-SLATE may carry gold in various localities where these rocks occur; in fact, few rocks can be set aside as certainly unfavorable to the deposition of gold.

The Caving System of Mining.

Written for the MINING AND SCIENTIFIC PRESS
By W. H. STORMS.

There have been important changes in mining throughout the world within the past twenty years. Two decades ago the mining of large orebodies was usually accomplished by the excavation of great stopes which were substantially timbered with square sets. In some cases these timbered stopes were filled with waste, the management showing creditable promptitude in attending to this very necessary detail, but in other instances neglecting it so long that it was impossible to avert costly consequences. In time it came to be generally recognized that filling was a necessary adjunct of mining by the square-set method, for only by employment of it could all the ore be extracted, and disastrous caves prevented.

The constant changes taking place made it, in time, possible to work successfully mines which a few years previous were not profitable. Many orebodies were known, the commercial possibilities of which were not inviting, unless a less expensive method of mining could be devised than one requiring so large an amount of timber as that demanded by the square-set method.

The proverb says: "Necessity is the mother of invention." Nowhere is this better exemplified than in the mining of low-grade orebodies. Throughout the West an ore is considered low-grade which contains $3 to $4 per ton, and there are many instances where such material is mined and milled at a profit, the most noted examples being the Homestake, in South Dakota, and the Treadwell, on Douglas island, Alaska. It is not only low-grade gold mines that have to employ every art and device developed by experience to reduce the cost of production to a minimum, but some of the low-grade copper mines of the world as well, and more particularly the iron mines of Minnesota, Michigan and Wisconsin. The great iron mines produce various kinds of ore — ore both high and low in silica; that which will bessemerize, and that which will not. The present price at Lake Erie ports for these ores varies from $3.50 to $4.25 per ton. This small amount of money must pay, not only for the mining, but for transportation from the mines to the docks on Lake Superior, for moving the great ore piles to the holds of steamships, and for transportation to Cleveland, or some other port on Lake Erie, and the transfer of the ore from the ship to the shore.

Necessarily the mining must be done cheaply. Most of the ore is excavated by steam-shovels from great oval pits, the shovels working from tracks laid on terraces, one above another in the constantly extending excavation, which in time covers many acres. Some of the mines eventually excavate these pits so deep that the open-cut practice is no longer advisable, and an underground system of mining is adopted. In some cases the mill-hole method is found to be a satisfactory substitute for the open pits, the ore broken in the pits being sent through mill-holes to a lower level where it is loaded into cars and trammed to the main shaft, sunk usually outside of the deposit of ore, in the country rock. Some of the softer orebodies are mined by square-set method, but the expense of timbers led to various experiments in an endeavor to mine without them, one of the most successful, particularly in the hard orebodies, being the caving system. Of late, a great deal has been said of the employment of the caving system in connection with the operation of metal mines of the West, but many seem to have a misapprehension of what the caving system really is. Some seem to think it contemplates the excavation of a large stope, up to the danger limit, abandoning it, and after the inevitable cave, endeavoring by some method, safe or otherwise, to recover the ore which it has "cost nothing to break," from this cave. This idea substantially is correct, but it is the work of preparation that requires careful planning and execution. Briefly, the caving system is a method of blocking-out and under-cutting an ore-

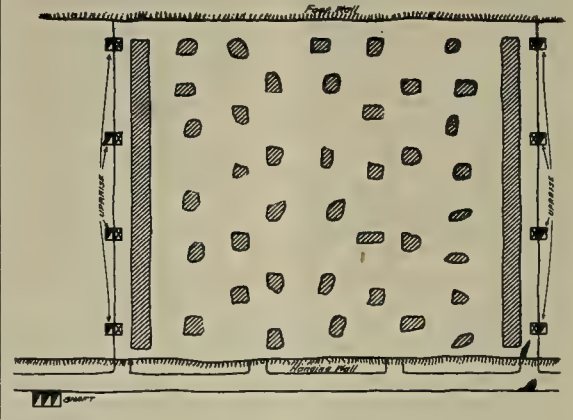


Fig. 1.

body in such manner that it will gradually settle, fracturing and crushing the ore, by its own weight, into pieces of such size as may be readily handled when it is to be removed.

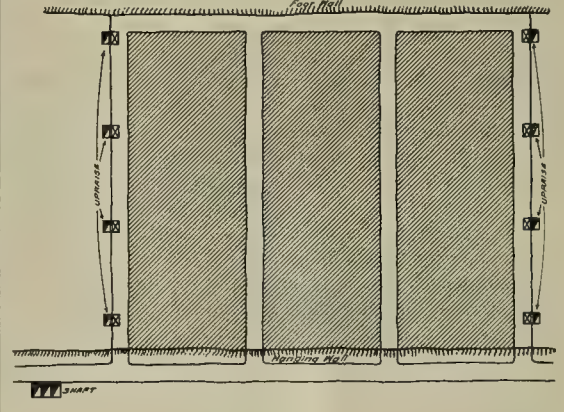


Fig. 2.

To operate the caving system effectually, with satisfactory economic results, the conditions must be suitable. It works best where the lode-walls approach the vertical, say above 65 degrees, and where the ore-mass is of liberal

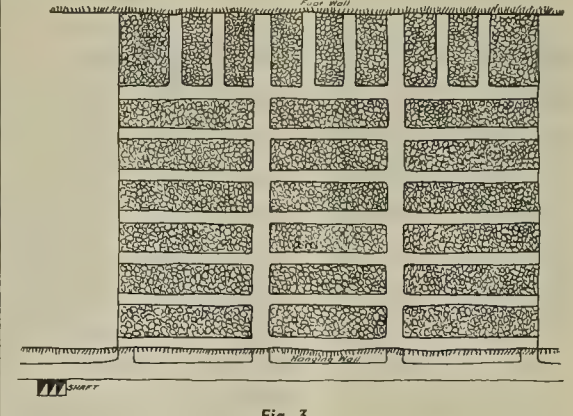


Fig. 3.

width. It is applied most safely to hard orebodies, and, with certain limitations, to soft orebodies as well, though the latter must generally be stoped in sections of smaller length for safety of the miners, if for no other reason. Flat

sheets of ore, and those having a low angle of dip, may also be worked by the caving system, if they are thick enough—70 to 80 ft. or more. If the orebody has not sufficient thickness to cause the mass to be fractured or crushed from the movements set up within itself, as a result of caving, the system cannot be applied economically.

At the Pewabic mine at Iron Mountain, Michigan, a system of caving was evolved several years ago, which proved safe, and required little timber. The method was successfully applied at that mine for a long period and without doubt it is applicable elsewhere to other than iron mines where the physical conditions do not render it prohibitory. It may be described as follows:

The level about to be attacked is first blocked-out from a main gangway cut in the hanging-wall slate, about 20 ft. from the orebody. This is usually run for a distance of 250 ft., the ordinary length of a block. From the gangway cross-cuts are run at right angles to, and across, the orebody to the foot-wall side, where a drift is driven along the foot-wall. In one of these blocks there are generally four of these cross-cuts, approximately 80 ft. apart. From the outside cross-cuts of this series of four, that is, those on the right and left side of the block respectively, raises are started to one side of the cross-cut—not directly overhead. These raises are spaced about 50 ft. apart, their number depending on the width of the orebody; they are driven to a height of 80 ft., the levels being 100 ft. vertically apart. When well started, chutes are constructed at the foot of these several raises, and when the miners have reached a point 20 ft. below the next level, they begin to open out the raise by enlarging it in the direction of the walls, cutting out a section by under-hand stoping, about eight feet wide, which reaches from wall to wall, and from the 80-ft. point to the back of the level below. As the ore is blasted down into these raises most of it runs by gravity to the chutes, to be drawn into cars and trammed to the shaft.

While these cross-sectional slices are being cut and removed through the raises, ore is systematically broken on the level below; the cross-cuts are widened and longitudinal drifts are extended, right and left, through the orebody, blocking it out into a series of rooms and pillars, about eight feet high. These rooms and pillars are carried to within 15 or 20 ft. of the outside cross-cuts of the series where a solid block of ore is left 15 to 20 ft. wide, which reaches nearly from wall to wall of the lode. The pillars are then robbed up to the limit of safety, and sometimes a little beyond it, the work being carried on from the foot-wall side toward the hanging, to minimize danger to the miners. Holes are then drilled in the pillars at proper points; the long end-pillars are greatly reduced in size and their remnants also drilled. When the whole block has been thoroughly under-cut, the pillar-holes are fired in series, and gravity does the rest, for the entire great block of ore soon thereafter begins to cave. It falls usually in big pieces, but the continued caving and shifting of the tremendous weight from place to place within the mass, in the course of a few months causes the entire block of hard, silicious ore to become reduced to fragments, the greater portion of which will pass a three-inch ring.

When the entire block has settled, usually after six to eight months, the real work of extraction begins; all that has been done previously is preliminary. The two central cross-cuts are reopened in their extension from the main gangway, in the hanging wall, and driven into the mass of ore now thoroughly broken. These cross-cuts are heavily timbered with drift sets, and lagged. From them drifts are driven at intervals of 25 ft., and these also are substantially timbered, to resist the crushing force of the constantly settling ore. The drifts are run to the limits of the block at either end and the drift nearest the foot-wall is run to connect the two central cross-cuts. From this drift, at every 25 ft., short cross-cuts are driven to the foot-wall.

The ore is then shoveled into cars from the ends of the cross-cuts and drifts as fast as it runs in. The small size of the ore fragments causes it to run regularly, and a large tonnage can be removed daily, there being numerous working places. A shoveling crew consists of four muckers and one experienced miner, whose duty it is to look out for the safety of the men and to act in the capacity of overseer or shift-boss.

Eventually, the removal of the ore from the ends of the several faces, in drifts and cross-cuts, forms openings or depressions varying in size and shape overhead, and the filling and old timbers from stopes previously worked above, settles into the holes made by the draw-off. The presence of this material is noticed by the miners as soon as it appears at the shoveling places. A set or two of timbers is then blasted out and the working place removed correspondingly nearer the hanging wall. When the ore has been removed from that portion of the block lying between the foot-wall and the first drift, other drifts are run from the main cross-cuts and the ore withdrawn from there in the same manner as before, until all of it has been recovered and its place taken by waste from above.

Hundreds of thousands of tons of ore were mined by this method without a single fatal accident chargeable to the system, and it may be applied elsewhere with such modifications as the particular conditions suggest or impose.

There are several other methods of caving orebodies, but all aim to accomplish the same result, that of blocking-out and under-cutting large masses of ore in safety, and later, when a whole block has caved and been crushed by its own weight, to remove it in safety with minimum loss of ore, and the employment of very little timber. The driving and timbering of the drifts through the caved ore is a difficult operation, requiring much skill on the part of the miners. At first it would appear that the original drifts and crosscuts might be timbered at the time they are driven, but, it is evident, on second thought that when the tremendous pressure from the caving mass settles upon the timbers they would be crushed beyond repair, and their usefulness would be at an end. A column of hematite one foot square and 92 ft. high would weigh approximately 28,000 lb. A drift-set would cover, at the top section, a superficial area of, say 25 sq. ft. Then the direct pressure upon this set would be about 700,000 lb. to be sustained by four posts, each perhaps 24 in. diam. Theoretically these timbers should be capable of withstanding much more than this amount of compression, but timber tests are generally made on selected well-seasoned samples of small section. It is impossible to duplicate these favorable conditions underground; moreover, the direction of compression is seldom constant, but shifts from point to point as the unequal settling of the ground transfers its weight from one direction to another. Miners learn by experience about what to expect from timber sets in the course of time, and act accordingly.

At the Homestake mine large underground excavations are made, the broken ore being left in the stopes resting on the timbers of gangways which have been previously run on the sill-floor. These stopes are 60 ft. wide and 400 to 500 ft. long—the width of the vein. It has been proved in these stopes that the timber sets suffer severely from compression, and shifting of the load on withdrawing the ore—repairs and re-inforcement being resorted to frequently to keep the gangways open. This fact has led some miners, who have adopted the Homestake system

elsewhere, to open their main gangways underneath the sill-floor, which it is thought will protect the timbers to a great extent, though this practice has not, so far as known to the writer, been in use long enough to determine its expediency.

Where the ore breaks 'big,' this method of running the gangways under the sill-floor of the stope would prove expensive, but where the rock breaks into comparatively small fragments—not too large to readily pass a chute-gate—it would probably work satisfactorily, and, as where the caving system is employed the ore does usually break small, it is possible that these sub-gangways would be found to be an improvement on the method practiced at the Pewabic mine, which has been already described.

THE SIZE OF A STAMP-SHOE.—When feeding a mill with, say, 2½-in. rock, what ratio should the area of the shoe surface bear to weight of stamp? Are engineers obtaining the best results by increasing the weight of stamps without increasing the crushing surface? Is there a correct ratio between weight of stamp and area of shoe, for 2½-in. rock, and is there another ratio that ought to be used for rock of 1½-in.? Henry Louis, in his 'Handbook of Gold Milling,' states that a 1,050-lb. stamp, with a 6-in. drop, will completely pulverize a piece of quartz. The ideal efficiency of a stamp would, one would suppose, be obtained, if every time it descended on a bed of quartz particles completely covering the die, it completely pulverized them to the size required before its momentum was absorbed. If it did more, energy would be lost in striking the die, and if it did less, there would remain too much partially reduced fine on the die. If fresh quartz were fed on, the bed would be too elastic and the efficiency fall off. If the shoe struck again before fresh quartz was added, the power of the blow would be partially wasted on the die. Now, assuming that the feed is fairly regular, and the work to be done on the quartz particles lying on the die is in our stamper-boxes fairly uniform on each stroke, and remembering that to gain speed of drop we must keep the drop as near 6 in. as possible, it is obvious that there must be some right relation for any given size of ore fed in to stamper-boxes, between weight of stamp and area of shoe. In crushing with 1,050-lb. stamps, and, assuming the diameter of the shoes to be 10 in., with area of 78.5 sq. in., the crushing weight in pounds per square inch is 13.3. This, apparently, is not sufficient to get the best results from ore of a 2½ size, but it yields a better efficiency on ore of 1½ size. In all cases I have known of stamps being weighted up, no attempt has been made to see if increased efficiency could be gained by increasing the area of shoe or varying the size of the feed. To do anything along these lines some experimental knowledge is necessary, and I believe a large field lies open in this direction. Take the case where the weight of stamp is increased to 1,350 lb. and the shoe remains 10 in. diam., the ratio is increased to 17.2 to 1. Might not a better result be obtained by increasing the shoe diameter to 11 in., with a ratio of 14.2 to 1? Again, if secondary breaking is employed, and the ore fed in 1-in. or 1½-in. sizes, should not this ratio be again modified to obtain the best results? Here we have an aspect of the subject that appears to have been somewhat neglected.—E. M. Weston, in *Jour. of the Chem. Met. & Min. Soc. of S. A.*

THE object of a cam, in a stamp-mill, is to convert uniform rotary motion into a uniform lift; the curve to be given to the face of the cam, in order to do this most efficiently, is one of the involutes of a circle, the radius of the circle being equal to the horizontal distance between the axis of the cam-shaft and that of the stamp-stem.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock specimen from Rhyolite, Nev., marked C. H. G., is infusorial-earth.

The small fragment of rock from Whidbey island, in Puget Sound, and described as from the 'Rock of Ages,' is fine-grained silicious greenstone—Diorite and Diabase. It is too much altered to make absolute determination possible.

It again becomes necessary to remind subscribers who send rocks and minerals for identification that it is important that these samples should be carefully labeled and wrapped. Numerous packages are received in bad condition, having burst open in the mail, and occasionally samples are missing from a series of numbered specimens. Microscopic specks in ore and rocks are difficult of determination, therefore it is well to send as good representatives of the mineral as it is possible to obtain.

The rocks from Tolo, Oregon, marked C. W. & P. Co. are: No. 28, Pyroxenite; No. 29 Aplite (fine-grained micaless granite); No. 30, Gabbro; No. 31, kaolinized feldspathic rock, probably originally Aplite; No. 32, Basalt; No. 33, Compact Volcanic Ash; No. 34, a much decayed greenstone, probably Diabase; No. 35, Diabase; No. 36, fossiliferous, arkose sandstone—that is a sandstone made up of granitic material; No. 37, Granite, apparently the bed-rock of No. 35; a small portion of sedimentary material is attached to the granite; No. 38, Volcanic Ash, which was deposited prior to the flow of basalt (No. 32).

The rocks from Seven Devils district, Idaho, marked E. W. S. are: No. 1, silicious fine-grained Diorite; No. 2, silicious eruptive rock, possibly Diorite, containing much pyrite and some sulphide copper ore; No. 3, altered Granite containing iron and copper sulphide; No. 4, a dike rock, possibly Felsite, much altered and showing development of silvery mica possibly from alteration of feldspar; No. 5, Diorite, the hornblende mostly altered to chlorite. It also contains a little copper sulphide; No. 6, a granitic rock, with semi-schistose structure; No. 7, dike-rock, probably Diorite; No. 8, a thoroughly altered feldspathic rock now principally Kaolin, quartz grains and the white silvery mica margarodite. All of the rocks of this lot are so much altered from decomposition that their original nature is uncertain.

The rocks from San Antonio, Texas, marked H. P. A., are: No. 1, fine-grained Quartz, with a little oxide and carbonate of copper. The surface is partly incrusted with calcium-carbonate; No. 2 is a kaolinized dike-rock; No. 3, mostly Quartz, mineralized by earthy-red hematite, copper-glance and a little copper carbonate; No. 4 is a kaolinized eruptive rock; No. 5 is a peculiar and very unusual rock. It has every appearance of wood fibre and resembles some of the semi-carbanaceous inclusions occasionally found in volcanic rock—as in the andesites of Virginia City, Nevada, and at Bodie, California. A little incrustation of copper carbonate is observable at two places on this rock, but repeated tests of the mineral, where no copper can be seen, gave reactions for copper. It is probable that it exists in the form of black oxide, which makes it difficult to see. Nothing similar to this has ever previously come to our attention, though said to be common in Nova Scotia.

The Valuation of Shipping Ores.

Written for the MINING AND SCIENTIFIC PRESS
By R. GILMAN BROWN.

One of the complicated problems that the engineer has to solve is that connected with the value of an ore that can best be realized upon by sale, and the most complex phase is seen where part of the valuable contents is directly recovered by some milling process and a part by the shipment of a sorted or concentrated product. As it is always easiest to approch these questions by the path of a concrete example, I base the following notes on the conditions of a well-known mine.

The ore is a complex one; free milling to a certain extent, it carries lead in appreciable amount and iron and zinc in sufficient quantity to modify the smelting charge on the concentrate product. The tailings are susceptible of cyanide treatment and yield by this means a small but noteworthy product. For an average month the returns, as taken from the books, are as follows:

Tonnage, 1,580 tons.	Total.	Per ton.	Per cent.
Saved by amalgamation	$3,132.42	$1.98	37.1
Saved by cyanide	1,123.59	.71	13.3
Realized from concentrate	2,583.41	1.62	30.4
Lost in tailing	.....	1.02	19.2
Total	.....	5.33	100.0

From the face of this statement it would appear that the ore assays $5.33 per ton, and that something over 80% is being recovered. That this is not really the case would become quickly evident if $5.33 rock were sent to the mill; the returns would be seriously less. The 'joker' lies in the sale of the concentrate.

To exemplify this, we will take the case of a single lot out of the six going to make up the shipment for the month. The basis of settlement is: 95% of the silver; 95% of the gold, at $20 per oz.; 90% of the lead at 1c. per lb. under the London quotation, with a reduction of 10c. per ton for each unit above 10%; 10% zinc is allowed and 50c. per unit per ton is charged for each unit above this. The excess units of iron over silica are credited at 10c. per unit per ton. Freight and treatment is $9 per ton. The smelter analysis of the shipment is: 11.5 oz. silver, 0.95 oz. gold, 12.1% lead, 10.3% zinc, 28% iron, 4% silica, weight 19.386 tons. The following table traces out each of the constituents, with the gross and net value for each.

Metal.	Quantity.	Gross value.	Deduction.	Net value.	Gross value rec'd.
Silver	222.94 oz.	$136.83	$ 6.84	$129.99	95%
Gold	18.417 oz.	380.68	12.34	.....	.....
			18.42	349.92	92
Lead	4,691 lb.	139.38	46.91	.....	.....
			9.25		
			4.07	79.15	57
Iron and silica	.....	46.53	.....	46.53	100
Total	.....	703.42	97.83	605.59	86%
DEDUCTIONS.					
Excess zinc	.....	.....	2.91	.....	.....
Freight and treatment	.....	.....	174.47	.....	.....
Total	.....	703.42	275.21	428.21	61

There were 115.3 tons of concentrate produced from the 1,580 tons of ore, making the proportion 7.3%. The lot thus analyzed weighed 19.386 tons, and accordingly on the average represented 265.6 tons. With this as the divisor the gross value of the gold and silver in the concentrate is found to be $1.94 per ton of ore, of the lead $0.52, of the iron and silica $0.17; a total of $2.63 being required to produce $1.62 from the sale of the product, the difference between the two covering the various charges imposed by the smelter. Let me say, in parenthesis, that there is no implication in this of a criticism of the smelter charge; it is as legitimate as any other part of the cost of production. The sole aim of this paper is to call attention to the ease with which it can be overlooked or misunderstood.

Returning: It is hardly practicable in the ordinary case of a mine of this kind to run the daily routine samples for a base metal, like the lead in this case, that would amount to less than one per cent, so that this assistance will be lacking. If it is a case of correctly estimating the values to be recovered from certain blocks of ore; concentration tests can be made, but unless special apparatus is available, these will be of doubtful use for estimating the average value of the concentrate, except in very expert hands.

After the regular run of the mine has become established, an empirical factor can be deduced that is perhaps as reliable as any method that can be adopted; but results thus obtained are only dependable when grade of ore and degree of concentration are fairly uniform. The value realized from the concentrate, per ton of ore, depends upon the degree of concentration both directly and indirectly. If the concentrating machines are run 'close,' the tailing goes up and the tons produced go down, so that less is actually saved from a ton of ore, but haulage and treatment on a smaller tonnage has to be paid for; there is less penalizing for silica, but zinc may be higher. Running 'coarse' on the other hand, reverses the situation, increasing tonnage and silica and possibly lessening the zinc.

For the case in question the empirical factor is 83%, that is, the value realized by sale is 83% of the precious-metal value in the concentrate. For the six lots included in the month's shipments it varies from 83 to 79%, with an average of 82%, which certainly is sufficiently uniform to be within the degree of accuracy of other parts of the work. Using this figure, we have the following connected value per ton for the ore:

Saved by amalgamation	$1.98	35.2%
Saved by cyanide	0.71	12.7
Saved in conc entrate	1.98	35.2
Lost in tailing	0.95*	16.9
Total	$5.62	100%

Moving one step further to a final analysis, we see that from an ore assaying $5.62 in gold and silver there will be realized $1.98+0.71+1.62 (1.98×82%)=$4.31 or 77%, and this will be the figure properly to be used in determining if any particular block of ore is 'pay' or not. This empirical method is the simplest, where it can be used; where it can not, no general hard and fast rule can be laid down, other than the most general of all, "watch out." It was solely with the idea of impressing the necessity for this that the foregoing brief study was taken up.

I have said that the case where the whole product was shipping ore was the simplest; if we assume an ore of the shipping value of the concentrate above, we shall have a fair example of this, in a somewhat extreme case as to grade. The gross gold and silver value per ton is $27.22 and the realized value $22.23. Here the facts are so clear that it can hardly be supposed that the two values would be confused, and yet to get a true estimate of what would be realized, the samples must be carefully grouped and analyzed by groups. The easier empirical method is not so useful as in the first case, for, while the difference between 83 and 79%—the maximum and the minimum—is negligible, when it only means a variation of eight cents per ton in the returns, when it means $1.09 it cannot be so considered.

An intermediate class is the straight concentrating ore, only a little less complicated than the first because of the absence of free values. Here the empirical method might be held to answer fairly, if there is sufficient basis for the figures, though on an ore of the grade referred to the variation might be 19c. While this would not be

*The tailing assay of $1.02 is for 92.7% of the ore, 7.3% having been removed as concentrate; this value spread over the 100% of original ore becomes $0.946.

ideal accuracy, it would likely be within the limits of error of deductions from ordinary concentration tests. A word about the determining of the empirical coefficient; it should be based on a long series, either of tests or results, and in important cases the probable error should be determined by least squares, which would enable the engineer to set forth in figures the probable variation from his average results.

Summarizing the foregoing: In straight shipping ores of good grade, prudence dictates that estimates should be based on analyses of group samples, representing average constituents of blocks or parts of blocks, these samples being prepared with as much technical skill as would be used for mere gold and silver values; in straight concentrating ore an empirical factor, representing the percentage of the total gold and silver value of the original ore can be used, or the probable value of the concentrate be determined by concentration tests. The former can be arrived at by true averages of many previous shipments—the preferable method—or by concentration tests, aimed at getting the same factor and to have included in it the probable error; in free milling and concentrating ores the same methods yield still better results, because of the smaller proportion of values saved in this form.

THE basis of pyrite smelting is the fact that pyrite is a combustible material, affording a source of heat which can be used in the blast-furnace. By employing a rapid current of air—the blast—it is possible to attain a maximum temperature.

SUB-BITUMINOUS COAL is the name applied to a class of coal next higher than lignite and below bituminous coal. It is commonly known as 'lignite,' 'lignitic coal,' 'black lignite,' 'brown coal,' etc. It is generally black and shining, closely resembling bituminous coal, but it weathers more rapidly on exposure and lacks the prismatic structure which is a characteristic feature of bituminous coal. Its calorific value is generally less than that of bituminous coal and greater than that of lignite. In mine samples, this class of coal usually shows a heavier percentage of moisture than bituminous coal, and a much smaller percentage than lignite, but the amount is variable. Contrary to general opinion, it is probable that the percentage of moisture can not be depended upon to distinguish the sub-bituminous from the adjacent classes. The localities in which this sub-bituminous coal is found include Montana, Idaho, Washington, Oregon, California, Wyoming, Utah, Colorado, New Mexico and Texas.



Church of Guadalupe, Mexico City.

IT is the principle of Mexican mining law, inherited from Spanish law, that the title to mineral riches vests in the State, and not in the individual possessing the surface of the soil, and in granting mineral patents the Government gives the applicant only the right to remove the minerals. In practice a Mexican mining claim, so long as the requirements governing its issue are complied with, is to all intents and purposes the same as title in fee simple. The distinction in principle remains, however, to the extent that it gives the State full authority and control and the right to insist upon the conditions which it stipulates with regard to the development of the riches covered by the conveyance.

Three Weeks in Mexico---II.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Vera Cruz is not the dirty city it used to be; the streets are cleaner than formerly, and the erection of new wharves and quays gives the incoming traveler an excellent impression. But the back streets and by-ways are not salubrious, nor does the ever present buzzard suggest pleasant imaginings. These hideous carrion birds are seen everywhere, flopping about in the streets, perched on roofs, even dominating telegraph poles; nay, their foul black shapes obscure the blue canopy, and desecrate the majesty of Orizaba.



Above Maltrata.

If you arrive in the morning on the way to Mexico City, you can leave Vera Cruz in the afternoon, so as to reach the town of Orizaba by dinner time. In this way, escaping from the coast and going to 4,000 ft. altitude, the traveler avoids the risk of the *calentura*, the fever of the tropical lowlands. The journey on the Mexican Railway is one of the wonders of the world, in respect of scenic beauty and variety of vegetation. At first the train winds through sandhills, partly hidden by abundant green, and then over marshy ground; but this is only for ten miles, when the ascent begins, over the lower plains. Sugar and corn appear; then comes a grass country interspersed with scrub and cactus, much like Natal, only the cactus here is in greater variety and instead of anthills the surface is dotted with boulders of dark lava.

The train threads its way through rank grass and past frequent hedges of organ cactus; the scars made by the railroad, even the steepest banks, are entirely healed with verdure. When the locomotive stopped we heard the broken notes of the *orache* and there was further confirmation of the plentiful bird-life, already suggested by the nests hanging from trees and woven around the cross-bars of telegraph poles.

At thirty miles from Vera Cruz, near Soledad, the foothills are reached and in this well-watered tract the tropic vegetation is luxuriant in the extreme. The ridges of lava that mark the base of Orizaba are not at all like the Drakensberg, severely bare and drearily rugged, but they are absolutely smothered with rich verdure from foot to crest, and in the *canadas* or ravines now visible, as the train emerges from successive tunnels, there is a foliage of increasing gorgeousness. Between Camaron and Cordoba the botanical wealth of the tropics is lavishly displayed; nature, stimulated by warmth and moisture, has clothed the earth with splendor. There is the scarlet hibiscus, purple bougainvillea, the lavender plumbago, crimson oleander, pink azaleas, the yellow and red flags of the coleus, even magnificent orchids, with creepers of every shade of green festooning the forest.

Soon the train passes coffee plantations. The wild undergrowth has been cleared, but the larger trees are left in place, so as to give shade to the coffee shrubs (five to six feet high) that are planted between them. The young coffee shrub is delicate and must be protected from the direct rays of the sun for at least two years; maturity is attained in the fourth year. The plants live 25 years and require comparatively little labor, less than sugar, for instance. Speaking of these matters, it may be noted that chocolate is indigenous to Mexico and the word itself comes direct from the Aztec *chocolatl**; nevertheless Mexico nowadays imports chocolate from Guatemala and Caracas. Shade is imperative for the young coffee plant; in many cases it is cultivated under the protection of banana palms. This is the practice also in Ecuador, Peru and Brazil. It is said that the best coffee in the world comes from the famous Youngar valley, in Brazil, where it is grown in an old cemetery under bananas. The yield is only a few quintals per year, but this coffee fetches enormous prices. As a rule the small berries (*caracolillo*) are preferred, but the Youngar coffee is of large grain. Owing, however, to rankness of growth, many of the Mexican plantations looked so overgrown as, by reason also of the trees retained for sheltering the coffee, to seem like the bush primeval.

Soon we saw the yellow gleam of oranges and limes amid dark foliage; picturesque hamlets, with red-tiled roofs and thatched houses, and white-clad peasants. At the railway stations there was always a crowd of fruit-sellers; bunches of roses and magnificent bouquets of gardenias were purchasable for a song. But the pano-



A Coffee Plantation.

*The Aztec language is still spoken by a million people, chiefly in the States of Puebla, Jalisco and a part of Vera Cruz; it is a semi-flectional language like the Maya in Yucatan. The Otomie is absolutely different from the Aztec, it is monosyllabic and probably older; it is spoken by less than half a million people, chiefly in the States of Hidalgo, Queretaro and Mexico. Otomie in structure resembles Chinese and, indeed, it has been claimed that the modern Chinese immigrant can make himself understood among the Otomie Indians, but this, so I was told by Don Carlos de Landero, is neither *vero* nor *ben trovato*. "It is a mere philological analogy." However, the perpetuation of these ancient tongues is an interesting fact. Occasionally it is a nuisance, because of the difficulty of transmitting intelligence. At El Oro mine, for example, there are lots of men working underground who do not understand Spanish or its Mexican variation, and they have to be shown what to do by signs.

rama of life and color suffered eclipse as the darkness of the tropical night came suddenly, without any intervening twilight. We lost the famous view of the Barranca de Metlac, but even in the dim starlight I made out the outlines of the curved steel bridge, as the train swung round it; there was the gleam of the torrent below, a feeling of space and dark void, with the lights of dwellings far away.

For the town of Orizaba most travelers have a kindly feeling, because it brings the first sleep on shore after the sea voyage, it means a good dinner at the Gran Hotel de France and a perfect cup of coffee, a mixture of Caracolillo and Cordova berries. Early breakfast in a *patio* (courtyard) bowered by bougainvillea, to the music of a fountain, gave the bracing morning air a perfume and a fragrance long to be remembered. The mountain is visible from the town, but the view is not impressive. On resuming the train journey, we were soon climbing a heavy grade, circling the famous Maltrata valley and ascending 4,000 ft. more in a distance of 30 miles. One looks down over precipitous slopes of vivid green along narrow gorges that lead to a valley cradled among the onlooking mountains and checkered with squares of cultivation. The little huts and the clusters of trees look like the playthings of a doll's house, infinitely far away and quite detached from the busy life that throbs through the train with every effort of the locomotive. This view of Maltrata bears some resemblance to that obtained when descending from the upper to the middle plateau of the Drakensberg, Pietermaritzburg taking the place of Maltrata.

As everybody ought to know, the interior of Mexico is a high plateau enclosed within mountains of volcanic origin; this plateau rises suddenly from the lowlands that fringe the eastern coast and it is bounded westward by the Sierra Madre mountains, a part of the American cordillera, on the farther slope of which there is a sudden descent to the coastal plains of the Pacific. In traveling from Vera Cruz to Mexico City, a part of this structure is made manifest. The *tierra caliente*, or warm lowlands, forms a narrow strip to which succeeds the temperate zone or *tierra templada*, between 3,000 and 6,000 ft. above sea level, then by abrupt ascent one comes into the *tierra fria* or cold country of the high tableland, at an altitude of 6,000 to 8,000 ft. Any rigor of climate which might be due to a high altitude is tempered by the latitude, so that Mexico City, at 7,349 ft., and a little south of Lat. 20 degrees north, has a temperature ranging between 60 and 75 degrees the year round.

Mexico is 1,950 miles in greatest length, from north-northwest to south-southeast; her northern frontier is 1,500 miles long, while at the isthmus of Tehauntepec the breadth of land has narrowed to a neck of 130 miles, separating the two oceans. A few dates will recall the history of the country. Cortez and his company of adventurers captured the City of Mexico in August, 1521. Three hundred years of Spanish government, varied by revolutions, ensued. In 1810 the people finally revolted against Spanish dominion and after an internecine strife of eleven years, independence was gained. Iturbide, in command of the insurgent troops, marched into Mexico City on September 21, 1821. It was almost exactly three centuries since Hernando Cortez made his triumphal entry. In 1821 Mexico owned an enormous territory; beside the lands of the present Republic, she ruled Guatemala, and to the north all that part of the United States (up to Canada) which is west of the Red and Arkansas rivers. Much of this domain was lost as the result of the war with the United States in 1846 and 1847. Peace was made by the treaty of Guadalupe Hidalgo in 1848. In the territory ceded at that time was the whole of the Rocky Mountain region and California. I have never seen it remarked that while this treaty was signed on February 2, 1848, the first discovery of gold, by James W. Marshall, at Coloma, was made on the January 19 preceding, or two weeks earlier. Mexico did not know what she was losing and the United States did not know what they were gaining. It is certain that had the gold-fields of California remained under Mexican rule during the days of early discovery and prolific production, there would have been complications, into which the European governments might readily have been drawn by reason of the magnitude of the prize at stake. It was fortunate indeed that California became United States territory before her mineral wealth had aroused the greed of the nations.

To return to our story; we had seen Maltrata and had reached Esperanza, 8,044 ft. above sea level. Here the plateau extends with a sandy severity reminding one of parts of Arizona; from the moist air of the tropics we had passed into the dusty winds of the highlands. To the north, Orizaba hid his great head under a panoply of cloud and over the brown plains to the west were the white summits of Popocatepetl ('the smoking mountain') and Ixtaccihuatl ('the white woman'). This part of Mexico is largely given to the cultivation of the *maguey* or aloe, the *agave Mexicana*. Just beyond Apam the valley widens, becoming one immense plantation of *maguey*, reaching in ordered sequence and in lines of mathematical regularity to the dark hills in the south. The accompanying photograph illustrates the appearance of such a plantation. *Maguey* is the plant the fermented sap of which yields *pulque*, the national drink of the Mexican. It is the 'century plant,' which got its name from the idea that it blooms once in a hundred years; which is true enough in one sense, but the *maguey* does not bloom each one hundred years or at the end of one hundred years. It matures in seven years; at that time the central shoot springs up with extraordinary rapidity to a height of six or eight feet, and blossoms. But when cultivated as the source of *pulque*, this flowering of the plant is not permitted; as soon as the stem gives evidence of emergence, it is cut at the basal socket, so as to form a bowl in which collects the sap intended for the nourishment of the gigantic stem we associate with the 'century plant.' If the incision for the removal of the heart of the plant is done too soon or too late, it dies unproductive. The sap oozes into the socket and is removed twice a day at first, and then each morning. It collects at the rate of one to two gallons per day until, after about three weeks of tapping, the plant is exhausted. In extracting the sap, a slender gourd is used as a siphon; the operator places one end in the bowl and the other in his mouth, then he draws the sap into the gourd and pours it into a sheepskin bottle. These bottles are emptied into a pigskin bag, for loading onto the mules and *burros* that carry the stuff to the *hacienda* or farm, where it ferments over night, so as to be ready for transport to the City early next morning. In the course of travel this liquid intoxicant gains the smell of the untanned raw pigskin, acquiring a filthy odor, so that the *pulquerias* or saloons at which it is sold give forth a noisome stench. It is the whisky of Mexico and when fresh it is said to be palatable. To me it seemed to have a smell compounded of sour milk and tainted meat; it is good only (if at any time) when absolutely fresh, that is, when drunk in the locality where it is gathered. *Mescal* and *tequila* are other alcoholic products of the *maguey*; they are derived from the distillation of the roots. From the heavy pointed leaves, five to eight feet long, the Aztec made the paper on which his picture-writings were recorded. The modern Mexican uses the fibres of the leaf, after the plant has been exhausted as the source of *pulque*, to make twine (*pita*) and rope. With it he also makes the *ayate*

or coarse cloth in which earth, corn, provisions, almost everything, is packed for transport on his own or his mule's back; for instance, the pigskin bag holding the *pulque* is held in an *ayate*. It is said that 1,300,000 pesos* are spent each month in Mexico City for *pulque*, *mescal* and *tequila*.

It is recognized by physicians and other thoughtful men that *pulque* drinking is demoralizing both physically and mentally. (So also is whisky, especially bad whisky. An observant Mexican would find abundant cause for commenting upon the demoralization of the American and Englishman who soak poor whisky and make fortunes for the distillers.) Efforts have been made to curb the habit by moving the *pulquerias* farther from the centre of the City. The chief obstacle to such regulation is the long leases held by these saloons.

Barley and corn, probably wheat also, could be grown on the land now devoted to the *maguey*. In these cereals the country cannot supply the needs of the population. The duty on wheat was reduced for three months in 1905 by reason of the scarcity of flour and the *hacendados* tried to put up prices by creating a corner. In such matters as these President Diaz is enlightened; he abominates strikes and is opposed to monopolies injurious to the community; although there is one glaring exception to his usual methods. I refer, of course, to dynamite, in which commodity a monopoly has been legalized. This is the weak spot in his administration; some of his personal friends, and even his son, are interested in the concession which has been so hurtful to the mining interests.



The Palace of Chapultepec.



Maugey Plantation.

We reached Mexico City after dark, but the brilliantly lighted streets and crowded thoroughfares gave an impression of pleasurable life. That night I heard a splendid band (of the police) in the *patio* of the Iturbide hotel, playing in honor of the convention of American railway passenger agents. The volume of inspiriting music awakened every corner of the building which was once Iturbide's palace. But if the first Mexican emperor had revisited the glimpses of the moon, he would have bent his head with shame. On the second floor, there is a corner room that once held a shrine; it was Iturbide's chapel, and now it is a trunk-room wherein are deposited the multitudinous wares of itinerant Chicago drummers! *Es triste.* It reminded me of Kingsley's words, inscribed upon the drop curtain of the Tabor Opera House at Denver:

"So fleet the works of man, back to the earth again;
Ancient and holy things fade like a dream."



On the Trail.



Mt. Orizaba.

*Throughout these articles the Mexican currency will be expressed in terms of *pesos* and *centavos*, while the gold standard will be expressed in terms of 'dollars' and 'cents.' One dollar is roughly equal to two pesos.

How Bodies Fall in Deep Vertical Shafts.

Written for the MINING AND SCIENTIFIC PRESS
By F. W. McNAIR.

The mystery of the dark has always hung over caverns, whether of nature's excavation or of the digging of venturesome man. Especially is this so when they attain great extent or great depth. Instinctively one feels that in a very deep shaft or far underground, conditions must be quite different from those one finds on the surface, and, perhaps because of the one obvious and striking difference due to the absence of light, there is a tendency to expect the uncanny. When, therefore, there is made the statement that objects dropped into the deep shafts of the Lake Superior copper district "do not fall to the bottom, but are invariably found clinging to the east side of the shaft," probably the average reader is apt to credit the statement as noting one more of the mysterious facts which belong to the underworld, without any serious attempt to inquire what may be the truth of the matter. When the press correspondent, in telling it, adds a touch of the gruesome in the implication that among the objects frequently found "clinging to the east side of the shaft" are the pieces of a dismembered human body, one may suppose that reportorial skill has reached its limit, and that there has been produced a real gem of a newspaper story. Such a story was put forth not long ago by an enterprising correspondent and was copied in the daily press throughout the length and breadth of the country. One may question whether a plain statement of the truth will obtain more than a fraction of the same extent of circulation.

Yet the truth, though it contains, of course, nothing of the supernatural and little indeed of the unfamiliar, is nevertheless sufficiently interesting to make it worth while to narrate the facts that lie behind the statement that objects dropped into the deep vertical shafts do not fall to the bottom.

To begin with, this statement in itself is much more nearly exact than the thoughtful person would at first be inclined to believe. Very rarely, to say the least, do objects falling from the collar reach the bottom of the shaft, nor, indeed, anywhere near it. On investigation, this fact is not so very surprising nor are most of the reasons for it so far to seek. The vertical shafts of the Lake Superior copper district are very deep, some of them the deepest in the world. Further *in proportion to their depth* they are of small cross-section. The common impression seems to be in contradiction to this last statement, and at first sight when we learn that a shaft like No. 5 of the Tamarack mine is 9 by 30 ft. in cross-section, its horizontal dimensions seem little short of colossal. But if it is noted that at 5,000 ft. the shaft is over five hundred times as deep as it is wide, the horizontal dimensions begin to look small.

Moreover, it must be remembered that the shaft is divided by the timbering throughout its depth into compartments, the larger of which are roughly five by seven feet.*

Really then in the deepest shafts the separate compartments form tubes more than seven hundred times as deep as the greater horizontal measurement and over one thousand times as deep as the smaller dimension. In proportion they do not differ greatly from the tube of the ordinary chemical thermometer. My experience is that few persons even among those somewhat familiar with such shafts realize or comprehend these proportions. This is undoubtedly because to a person in it so little of the length of the shaft is visible at one time. Taking into account the relatively extreme smallness of cross-section, it is easy to see that an object falling into the shaft must follow a straight line almost exactly parallel with the axis of the compartment, if it is not to hit a wall in its downward course.

If the walls were smooth the object might strike many times, and, simply rebounding, keep on its downward way. But in a shaft timbered in the ordinary manner, striking the walls means a lodgment sooner or later and consequent interruption of the fall. In the Tamarack No. 5 shaft the length of the set from centre to centre is six feet.† Back of these timbers there is either an irregular rock surface or the irregular surface of the lagging. There are, therefore, more than eight hundred opportunities for an object striking an outside wall on its way down to find lodgment.

Were there no air present a body would require more than 17½ seconds to fall 5,000 ft. The air in the shaft, denser than at surface, increases the time occupied in descent. Under such conditions it is clear that the horizontal velocity permissible, if the body is to reach the bottom, is small indeed. Less than one half a foot per second would carry it clear across the longer horizontal dimension while it was falling. Objects dropping into the shaft under ordinary conditions nearly always start with some horizontal velocity, indeed it is usually due to such initial velocity in the horizontal that they get into the shaft at all.

Almost all common objects are irregular in shape, and, drop one of them ever so carefully, contact with the air through which it is passing soon deviates it from the vertical, giving it a horizontal velocity, and this when the air is quite still. The object slides one way or another on the air it compresses in front of it. Even if the body is a sphere, the air will cause it to deviate, if it is rotating about an axis out of the vertical. Again, the air in the shaft is in ceaseless motion, and any obliquity of the currents would obviously deviate the falling body from the vertical, no matter what its shape. If the falling object is of iron or steel, the magnetic influence of the air and steam-mains which pass down the shaft, and which invariably become strongly magnetic, may cause it to swerve from a vertical course.

The hindrances to describing a vertical path so far considered are well within familiarity for the person of average information, but there is another cause of deviation the action of which is not so familiar, and which yet operates to carry a falling body to one side, always in a definite direction. The cause itself is familiar enough, being nothing other than the diurnal rotation of the earth on its axis. Because of this rotation, a body dropped from a fixed position or projected vertically downward will, if then left entirely to itself, bring up always to the eastward of the vertical along which it would otherwise fall. It might seem at first thought as if the body should depart from the vertical to the westward rather than to the eastward since the earth rotates in the latter direction. However, the so-called fixed position is fixed only with reference to the earth's surface, and the object before release partakes of the same motion, and has the same velocity, as all other 'fixed' objects in its neighborhood. Were it at the equator this speed would be, say, a thousand miles per hour. The speed grows less toward the poles, where it becomes nothing. In fact the object is traveling in the circumference of the circle of latitude in which it happens to lie. Points beneath it have a speed which is smaller as they lie nearer the axis of rotation. The freely falling body retains the eastward speed with which it started, and so gains on the slower moving parts, of the earth which it is approaching. It, therefore, moves eastward from the vertical in which its fall began. The reader who in his study of physical geography worked

*See 'The Copper Mines of Lake Superior,' by T. A. Rickard, p. 93.

†See 'No. 5 Shaft at the Tamarack Mine,' by W. E. Parnall, Proceedings Lake Superior Mining Institute, 1901.

over the reason of the easterly or westerly deviation of the trade winds was considering an exactly similar set of conditions.

This easterly deviation was pointed out by Newton over two centuries ago, who stated in the quaint language of the day that the falling body "will not descend the perpendicular * * * * *, but outrunning the parts of the earth will shoot forward to the east side of the perpendicular * * * * *."‡ It has therefore been a fact well known to physicists for a long time.

During investigation of the cause of the divergence of long plumb-lines hung in No. 5 shaft of the Tamarack mine,§ some of the mining people called attention to "the old Cornish method" of plumbing a shaft by dropping a suitable object like a spherical shot from a determined point of suspension at the collar of the shaft and receiving it in a prepared bed of clay at the bottom, the vertical being then assumed as the line joining the point of suspension with the centre of the depression made in the clay. This suggestion led those engaged in the investigation to discuss the amount of easterly deviation which would be observed if a sphere were dropped 4,200 ft., the length of the plumb-line then under observation. A rough calculation by one of the party gave something like four feet. A deviation which could be consistently measured in feet excited great interest and every one concerned expressed a desire to witness a trial by experiment of so striking a demonstration of the earth's diurnal rotation.

Accordingly, at the end of a certain day's plumbing operations a steel sphere, chosen because it was the only convenient object at hand, was suspended about one foot from the timbers near the western corner of the compartment. The compartment stands diagonally with reference to the cardinal points. Forty-two hundred feet below a clay bed was placed, having its eastern edge some five feet east of the point of suspension of the ball. When the ball appeared to be still the suspending thread was burned, and the instant of the dropping of the ball was indicated by a prearranged signal transmitted by telephone to the observers below, who, watch in hand, waited for the sphere to strike the bed of clay. It failed to appear at all. Another like sphere was hung in the centre of the compartment and the trial was repeated with the same result. The shaft had to be cleared and no more trials were feasible. Some months after, one of the spheres, presumably the latter one, was found by a timberman where it had lodged in the timbers 800 ft. from surface.

It is, however, not probable that these balls lodged because of the earth's rotation alone. The rough calculation mentioned above gave too large a figure for the deviation. The matter is really more complicated than the foregoing discussion implies. It has received mathematical treatment from the great Gauss. According to his results, the deviation to the east for a fall of 5,000 ft. at the Tamarack mine should be a little under three feet. Both spheres had that much to spare before striking the timbers. It is almost certain, therefore, that others of the causes mentioned in the beginning acted to prevent a vertical fall. At any rate, these trials serve to emphasize the unlikelihood that an object which falls into a deep vertical shaft, like those at the Tamarack mine, will reach the bottom, even when some care is taken in selecting it and also to start it vertically. No account of the trials was published because they lacked serious purpose too much and were too crude to be dignified as real experiments, but they excited great interest among the people about the mine and talk about them spread until it finally gave foundation for the exaggerated press story of objects "clinging to the east side of the shaft."

If the timbering permits lodgment, as is the case in most shafts, it may truthfully be said that if a shaft is deep in proportion to its cross-section few indeed will be the objects falling into it which will reach the bottom, and such objects are more likely to lodge on the easterly side than on any other.

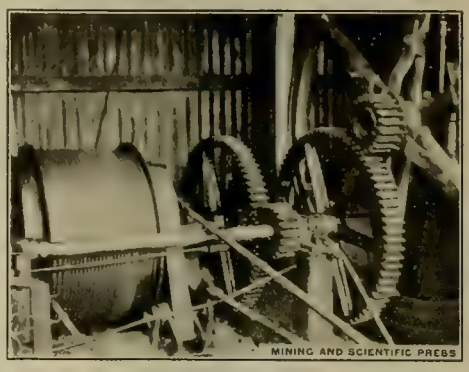
‡Quoted by Prof. E. H. Hall, Physical Review, Vol. XVII, p. 180, September, 1903.

§'Electrical World,' April 26, 1902, also 'Science,' June 20, 1902, or 'Terrestrial Magnetism,' September, 1902.

An Ingenious Hoist.

Written for the MINING AND SCIENTIFIC PRESS
By G. K. BRETHERTON.

The accompanying illustration shows the manner in which an old horse-whim was geared, connected to, and driven by an 11-h.p. gasoline engine. The engine made about 250 revolutions per minute, under full load. This whim and engine were in almost continuous use for seven



An Ingenious Hoist.

years, during which time they hoisted 5,000 tons of ore, and all the waste rock from 2,500 ft. of drifts, winzes and raises, at a depth of 300 ft.; they were used to sink the prospect shaft (through which the above material was hoisted) to a depth of 525 ft. Upon reaching the depth of 525 ft. in the shaft, with the above equipment, a modern gasoline hoist was installed, the old whim being too slow, although it handled the load easily even at that depth.

The shaft was 4 by 5 ft. in the clear, and, being a prospect shaft, it followed the vein on an incline all the way down, but the dip was constantly varying, so that out of the 525 ft. there is not any 100 ft. that has the same angle.

The hoisting rope used was steel, half an inch in diameter; the bucket was of the usual round type, 22½ in. diam., and 33 in. long, with a capacity of 18,810 cubic inches, or approximately 900 lb. The ladders were used as skids also, being made of 2 by 4 in. pieces, with the rounds turned to the foot-wall side of the shaft.

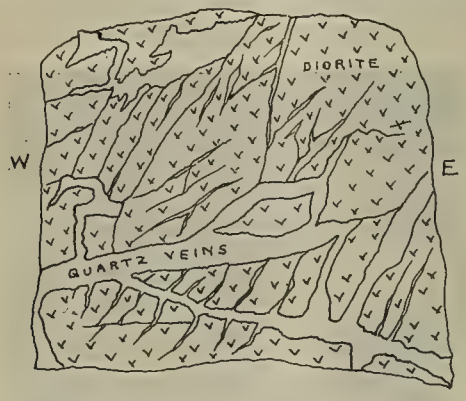
MAGNESITE is used not only as an ingredient of magnesite brick, but also in the manufacture of carbon dioxide and in the manufacture of paper from wood pulp. The carbon dioxide is liquefied and shipped in steel cylinders and is used for soda water fountains, and for refrigerating machines. In the manufacture of paper, magnesite is transformed into sulphite of magnesia and used as a digester for the wood pulp. Small amounts of magnesium chloride are used in cement. Combined with asbestos, magnesite is also employed as a lagging in steam-pipe casings.

THE Huntington-Heberlein process of treating lead ores is now in use at the Trail smelter, where the installation of an 80-ton roaster has been completed. The Nelson *Daily News* states that, while the record for the production of bullion bars at Trail heretofore has been 290 in one eight-hour shift, under the new conditions 520 bars have been produced in a similar period of time.

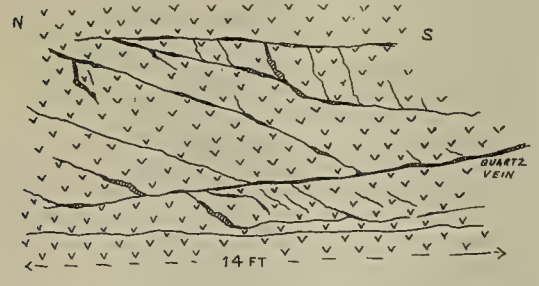
The Relations Between Gold and Pyrite.

Written for the MINING AND SCIENTIFIC PRESS
By HENRY LLOYD SMYTH.

George F. Becker has frequently pointed out the fact that ore deposits often contain pyrite of two distinct origins. One kind has been deposited with quartz or other vein-stones in pre-existing open spaces, while the other has formed either in the wall-rocks or in the included 'horses' of the vein, in the place of some original iron-bearing mineral. Evidently an essential difference between these two varieties of pyrite is that, with the first, both the sulphur and the iron have been brought in from a more or less distant source, while in the case of



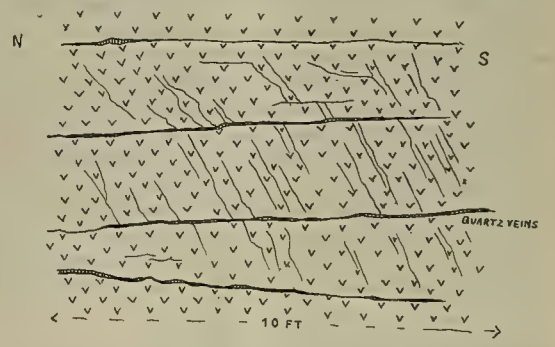
the second, only its sulphur has come from the outside. Mr. Becker has stated* also that in the ore of the Alaska-Treadwell mine, where both varieties of pyrite are found, there is reported to be a noteworthy difference in their gold content, the first or open-space pyrite being relatively rich, while the second or autochthonous pyrite is relatively poor in gold. The object of this note is to give a



brief account of an occurrence of gold where similar facts were observed by the author and his associate, C. M. Weld.

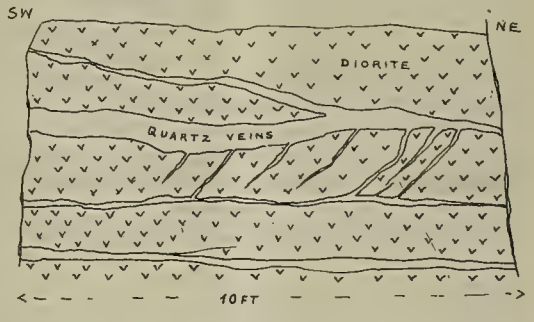
The orebody in question, which also is situated in southeastern Alaska, is a part of a mass of rather coarse-grained quartz-diorite. Within a zone about 80 ft. wide, the diorite is cut by several fault-fractures, nearly parallel and steeply inclined. Along, and between, these master-fractures the diorite is intersected by a multitude of small quartz veins carrying bunches of pyrite. The largest veins are seldom more than a foot wide, and these belong to a nearly horizontal system, the members of which cross from one master-fracture to another. The horizontal veins are connected by smaller veins, which either intersect in the most intricate manner or perhaps oftener exhibit a rude parallelism. The accompanying figures, which fairly represent these relations, are from sketches made in the mine. The quartz veins contain practically all the value of the ore, although they are so closely spaced and so tightly frozen to the rock that the whole mass, including diorite as well as quartz, has to be broken and sent to the mill.

Evidently before the mineralization, the diorite in the fault-zone had been cracked and crushed and the fragments had settled between the master-fractures in such a way as to open the horizontal fractures relatively widely. Afterward the pieces were re-cemented by the filling of all openings with quartz and its associated minerals. The mineralization also affected the cores of diorite between the cracks. In these cores the rock is somewhat softened, bleached, and well sprinkled with pyrite, the quantity of which visibly diminishes as the distance from the quartz veins increases; but even in the interior of the largest cores it is very noticeable. It was a matter of interest to us to determine whether this pyrite in the country-rock



carried as much gold as that in the veins. The investigation was conducted as follows:

Pyrite was collected from the bunches in the larger quartz seams from all parts of the mine. After crushing and removing, by panning, as much of the gangue as possible, the remaining sulphides assayed about $115 gold per ton. Next, mineralized diorite was selected from various parts of the mine, particular care being taken to



include in the sample no rock which contained visible vein-quartz. This was crushed and the sulphides, by panning, were obtained as clean as possible. These carried only $17 gold per ton, or less than one-sixth the value of the pyrite of the veins.

The gold of this ore was apparently almost wholly contained in the pyrite, less than six per cent of the assay-value having been recovered by amalgamation in the milling of several thousand tons, while the concentrate was of high value. The following experiments seemed to us to throw light on the physical relation of the gold to the pyrite.

Pyrite was selected from various localities on one level, the aim being to get it as free from gangue as possible. It was broken to pass an 18-mesh screen and panned; after drying, the concentrate was divided into three classes by running it over 40 and 80-mesh screens. Silica and gold were determined for each class. A similar experiment was carried out with pyrite selected from various points on another level.

*18th Annual Report U. S. Geological Survey, Part III, page 68.

The results, in round numbers, were as follows:

PYRITE FROM LEVEL A.

Mesh.	Percentage of whole.	SiO_2 %.	Average per ton.	Average per ton for 100% pyrite.
18 to 40	40	6	$ 73	$ 78.73
40 to 80	40	19	81	100.09
Below 80	20	23	264	342.80

PYRITE FROM LEVEL B.

Mesh.	Percentage of whole.	SiO_2 %.	Average per ton.	Average per ton for 100% pyrite.
18 to 40	40	3.5	$142	$147.45
40 to 80	40	9.5	188	207.73
Below 80	20	13.5	589	680.92

In the first case the product below 80-mesh, although only about one-fifth of the whole in quantity, carried 47% of the gold. In the second case it carried 49%. The fine (below 80-mesh) was carefully examined under the microscope for free gold, but none was observed. The tailing from the pannings was not sampled in this particular set of determinations. In another similar set, however, it had run $0.77½, $2.06, and $4.90 per ton. It seemed quite certain therefore that the gold was contained either in the pyrite, or in some mineral very closely associated with it. Qualitative tests of the fine concentrate showed that it contained neither copper, tellurium, arsenic, nôr bismuth. The pyrite was apparently exceptionally pure. On treating the fine with nitric acid and examining the washed residue under the microscope, a large number of minute particles of gold appeared. These particles in many cases had a dull surface. A few had a side or corner rubbed bright.

These experiments seemed to us to indicate that most of the gold was situated on or just within the pyrite, along cracks or close to the surface of the grains. On breaking the grains in the mortar the surface or richer portions would be reduced to powder first, and this would account for the concentration of the minute particles of gold in the fine.

The higher value of the pyrite in level B, which is below A, is clearly due to secondary enrichment.

WHEN it becomes necessary to mine a vein or ore deposit under a stream or body of water care must be taken not to carry the workings too close to the surface. It is much better to remove ore from the deeper portion of the vein first, leaving that nearer the surface until the last, for in a number of cases where haste has been made to recover ore extending under water it has resulted in the flooding of the mine to an uncontrollable extent from carrying the workings too close to the danger point.

THE overbearing manner of the average American in Mexico, with his indiscriminate contempt for the people of every station in life, which he makes no effort to disguise, is not only humiliating, but is bad policy on the economic side. It arrays the people against us, and is responsible for a large share of that extortion which embarrasses nearly every enterprise which we establish in that republic. It is notable that Americans who affiliate cordially with the Mexicans do not suffer in this manner. We are now about to witness an attempt at the commercial conquest of Sinaloa by our people, which can be achieved with mutual goodfellowship to the eminent advantage of both if we are careful to maintain a spirit of fairness and fraternity. But Sinaloa is not California, and the brutal overwhelming of the Mexican population, which our courts and public opinion permitted there, cannot occur under the Mexican flag. The spirit and manners of the California pioneer will not aid in our peaceful invasion of Sinaloa, and it must be confessed that these unworthy characteristics are too much in evidence among the forerunners of that invasion. — Courtenay De Kalb, in *The Evening Post*.

Wonder, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By W. FAY BOERICKE.

Wonder, the scene of the latest mining excitement in Nevada, is situated about 22 miles northeast of Fairview, thus making it 80 miles from the nearest railroad point. It may be reached either direct from Fairview, or, as most prefer, by going to Westgate, 12 miles distant, where there is plenty of water, and thence to Wonder, 16 miles more. A stage leaves Fairview daily for the camp, and makes the trip in about six hours.

The new camp is situated in the Silver mountains, about four miles from the head of an old river channel, and half way between Chalk mountain and Horse creek. It is flanked on either side by high, rolling hills, which seem to be less broken than those surrounding Fairview. The tops are covered with a sparse growth of timber, which insures plenty of comparatively cheap fuel. There is enough mountain grass to feed burros.

The formation is typical of the desert region, there being the usual vast andesite and rhyolite dikes, with quartz and spar stringers throughout. To the south is an immense body of limestone of indefinite extent, cut by iron-stained porphyry. The outcrops, in general, are not particularly prominent.

The camp was discovered during the early part of June, sensational surface ore having been obtained from the Wonder claim. The news immediately brought a rush of men from Fairview, nearly depopulating it temporarily, and all surrounding ground was staked off for miles. Several new strikes were made, but nothing approaching in richness the original location.

The surface ore is extremely rich in chloride of silver, with accompanying sulphides and bromides. Gold is also associated with it. Assays running from $247 to $900 were obtained from the float. At Chalk mountain, 10 miles distant, there are bodies of silver-bearing galena, and with further development similar ore may be found at Wonder.

At present the camp consists of about 60 to 80 tents, no wooden buildings having been as yet erected, though several are about to be. Beside work on the Wonder claim, there is much prospecting going on in the surrounding hills, and several rich finds are reported, especially near Horse creek. Just now the camp is laboring under severe handicaps, the worst being lack of water. All water is hauled from Westgate, and has a ready sale at $6 per barrel. However, a new strike of water has been made three miles away, and there is every indication that a good supply will soon be secured. Prices of all commodities are high, but no higher than the conditions warrant. Meals of dubious quality may be had at 75 cents. Town lots are closely held, prices ranging from $150 to $400 in the centre of the town.

Wonder is emphatically not "a poor man's camp." All goods must be hauled in, and ore hauled out, to Hazen, and as the roads are in sandy soil, with frequent steep grades, freight rates are as high as 3½ to 5 cents per pound. But these difficulties can be overcome, and with an intelligent management of capital invested, Wonder should justify the good opinion already formed by conservative mining men who have visited the camp.

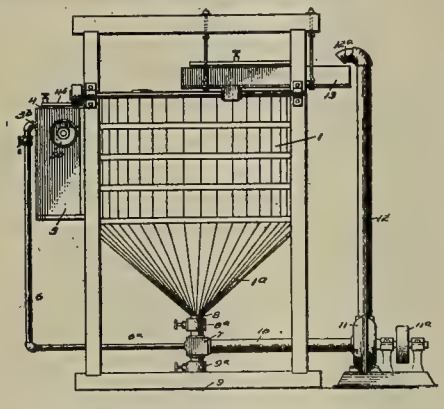
AT South Pasadena, Cal., there is a solar motor in successful operation. It comprises a huge concave reflector made up of 1,788 small mirrors, so arranged that they reflect the sunlight upon a slender boiler in the centre. Focus it toward the sun, and in an hour the steam produced is pumping water at the rate of 1,400 gal. per min. Thrust a piece of wood into the focus and the flames shoot up immediately.

MINING AND METALLURICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

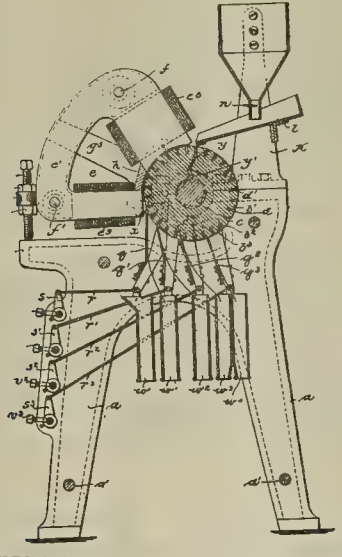
APPARATUS FOR RECOVERING PRECIOUS METALS. No. 822,940. E. J. Garvin, Portland, Oregon.

In an apparatus of the class-described, the combination with a main tank for receiving the pulverized ore and solvent, of a precipitating-tank, including means for separating the material, attached to the main tank near its top, and an amalgamating-tank including means for amalgamating the material suspended above the main tank, a hopper or funnel suspended within the main tank, and a spreading cone on the bottom of the main tank, and means for causing a continuous circulation of the materials and solution through said tanks.



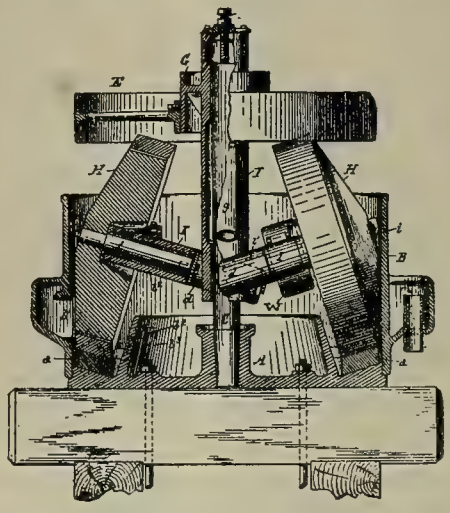
MAGNETIC-SEPARATOR. No. 823,304. F. T. Snyder, Oak Park, Illinois.

In combination, a field-magnet, an armature so related to the field-magnet as to be energized thereby, means for moving the armature and means for feeding material to be separated between the field-magnet and armature, the poles of the field-magnet being arranged, the one above the horizontal plane of the axis of the armature and the other in proximity to the horizontal plane of the axis of the armature whereby there is first produced a stratifying effect and then a separating effect upon the material passed between the field-magnet and armature.



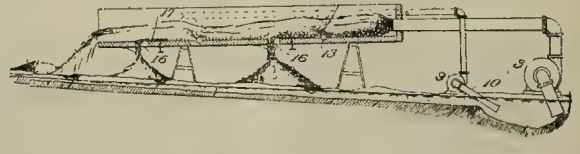
CRUSHING-MILL. No. 822,913. Martin P. Boss, San Francisco, California.

In a crushing-mill, a pan having a rim with an exterior channel, said channel having at one end an entrance communication with the pan, and return communications into the pan beyond the entrance communication, fender-plates disposed to guard against an outward flow from the pan through said return communications, while permitting an inward flow therethrough, and an overflow from the other end of said channel.



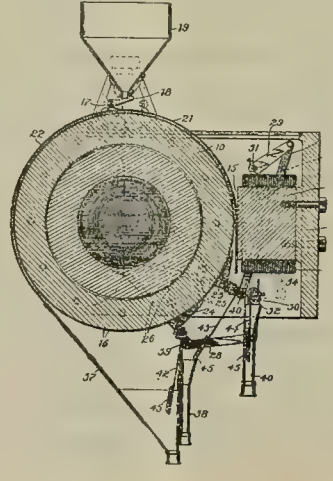
PROCESS OF TREATING ORES. No. 821,637. James C. Handy, Pittsburg, Pennsylvania.

In the treatment of arseniferous cobalt and nickel ores, containing silver, the process which consists in grinding and sifting the same to eighty-mesh fineness to separate metallics, fusing the sifted ore with sodium bisulphate to expel and recover arsenic, dissolving the melt and reducing dissolved silver with a fresh portion of ore, removing iron and residual arsenic together from the solution, removing cobalt and nickel by fractional precipitation with hypochlorite, and recovering sodium sulphate for reuse.



MAGNETIC SEPARATOR. No. 823,302. F. T. Snyder, Oak Park, Illinois.

In a magnetic separator, the combination with a magnet, of a pole on said magnet, a cylindrical armature adapted to rotate by said pole, a divider mounted to rotate about the axis of said armature, links attached to said divider, means for moving said links and means for feeding material to be separated to said armature.



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Editorial.

THE AMERICAN CONSUL at Rio Janeiro writes to warn people against the diamond mining schemes in Brazil. It appears that stock in several such companies is being offered to the unsuspecting public, not only in this country, but also at London. It is said that most of these diamond enterprises are frauds, organized by clever promoters, who make use of vague statements appearing in local papers.

THERE is a lady prospector in Nevada and she is said to be the only licensed lady broker in the sagebrush State. Already we learn that this feminine embodiment of Western energy has located "six beautiful claims, one of which has a red and white porphyry dike running through it." We expect even better results, such as a lacework of quartz seams or an insertion of calcite; if the lady prospector will but skirt the foothills she may find that the strata are pleated into lovely folds and that the limestone forms a ruching around the rhyolite. Beautiful is no name for it; the desert ought to blossom like the rose beneath her fairy steps and the geology of Nevada ought to become as dainty as an Easter hat.

WE TAKE PLEASURE in publishing an authoritative article on 'Mining in Korea,' by Mr. J. H. Curle, who writes to us from Seoul, the capital of that Japanese dependency. As yet, gold mining in Korea is identified mainly with the success of the Oriental Consolidated Mining Company, an excellently managed enterprise, with Mr. H. F. Meserve at the mine and Mr. Henry C. Perkins directing affairs at the home office, in New York. The Oriental Company has had the help of some of the most experienced men in the profession and among other things it has not made the blunder of introducing expensive foreign labor; it has trained the natives to become good miners. For this reason operating costs are extremely low and profits have been won from a low-grade gold ore.

A LOCAL PAPER states that "the people of Keswick are hopeful" that ore from a certain mine will be "run through the smelter" which has been idle for two years. The smelter is that of the Mountain Copper Company and it is idle because the people of Keswick and vicinity compelled it to close down by bringing black-mailing suits against the smelting company, alleging the destruction of valuable farms and timber-lands through fumes made by the smelter. The good people of Keswick have got their extremely valuable ranches to console them; and ranches, as we all know, employ a large number of skilled workmen, so that business ought to be flourishing at Keswick. You cannot eat your cake and have it. But we note that every time a new smelter starts, it is hailed as a benefactor to the community, until a few

millions have been invested locally, at which time one or two enterprising citizens come out with statements that their valuable hay-crop and timber-lands have been irretrievably ruined by the iniquitous smelter-man. Put a smelter at a distance from any farm and people will crowd around it, building up a community that will start a local agriculture to supply local needs—until such time as there is more money in litigation with the smelter company than there is in raising vegetables or growing hay.

THE ANNUAL REPORT of the Transvaal Chamber of Mines gives many interesting figures. The total amount distributed in salary and wages during 1905 was £8,762,344; of this, the 17,280 white employees at the mines received £4,778,191 in wages, and 1,975 members of the technical and clerical staffs got £821,675 in salaries; colored laborers, numbering 129,194, received wages amounting to £3,162,478. The total gold production since the beginning, in 1887, is estimated to have been £136,876,670; the output actually declared is £134,226,539, to which is added the undeclared yield during the war period. In ounces, the total output has been 32,223,486 fine gold. Production began, in 1887, with a yield of less than £100,000; increasing rapidly to £10,583,616 in 1897; to £15,141,376, in 1898; and then dwindling—by reason of the Boer war—until 1904, when it was £15,520,329. Last year was the record figure, £19,991,658, and this year will surpass even that prodigious production. The total dividends distributed during the 19 years from 1887 to 1905, inclusive, amount to £33,164,342. Seventy-four companies appear on this dividend list; the Robinson is the largest contributor with £4,514,688, the Ferreira comes next with £2,019,250, the Crown Reef has third place with £1,961,900, and the Langlaagte Estate is fourth with £1,692,880. The City & Suburban has distributed £1,462,913; the Bonanza, £1,255,000, the Geldenhuis Estate, £1,180,750; the New Primrose, £1,140,025; the Simmer & Jack, £1,041,461; and the Geldenhuis Deep, £1,035,000. Thirteen other companies have distributed over half a million each.

Mining and Metal Prices.

The cost of mining is a vital subject on which too much—if it be to the point—cannot be said. A thoughtful contribution, such as that of Mr. J. R. Finlay, on another page, is of the greatest service in clarifying ideas and we trust it will provoke further discussion in our columns, which are always at the service of the profession for such a purpose. Mr. Finlay brings forward an illuminating suggestion in regard to the relation between the prices of the useful metals and their degree of occurrence. On the face of it, the inference he makes seems obvious, for the cost of mining resolves itself into a series of efforts to get rid of the valueless portion of rock in which the particular metal lies encased. The same process is repeated in metallurgy, where, however, the intimate mixture of minerals constituting the rock as found in the mine is replaced by a chemical compound of metals and their salts; it is the metallurgist's aim to break up or modify that compound so that out of it is extracted, in the most marketable form, the particular metal or metals desired by the operator. Viewed in this light, the 'resuing' of the Cornishman, who strips a vein of rock so as to blast it down clean, is the most fundamental of all the series of operations that constitute mining and metallurgy. The next stage is sorting, preferably in the stope, so as to eliminate at once all unnecessary waste; and then at surface, whether by hand, aided only by a spalling hammer, or by the use of a rock-breaker followed by a picking-belt, increasing the speed of the operation and rendering it more mechanical. Whatever may be the skill and the science expended on the subsequent performances in mill or smelter, it is certain that the place to begin economy is at the very start—in the stope, and then at the ore-bin. This is a duty delegated as a rule to men who are not among the chiefs of a large staff; it is given to shift-bosses and foremen with whom directors and mine-owners fail to come in frequent contact. For this reason it is often overlooked or neglected. The economy of mining, like the structure of a building, must be well founded; it must begin at the first operation.

The cost of mining is interesting, because it is a prime factor in determining the profit to be won by the operator; but it is only one of the factors; the price which the metal will fetch after it is extracted, is equally decisive. In this connection it is interesting to note how the average prices of the useful metals rise and fall in company; the following figures are self-explanatory:

	1885	1894	1900	July, 1906
Copper—				
Cents per lb	10.70	9.56	16.17	18.25
Lead—				
Cents per lb	4.05	3.29	4.37	5.75
Zinc—				
Cents per lb	4.41	3.52	4.30	6.00
Tin—				
Cents per lb	19.58	18.08	29.90	39.25
Iron—No. 1 foundry—				
Dollars per ton	16.00	11.87	13.00	17.75

Eleven years ago the prices of copper, lead, zinc, and tin were all much lower than they are today, but these four metals fell in sympathy during 1894, to rise again in 1900 and to reach record figures in the present year. The rise has been due to the tremendous growth of industry, more particularly the industrial expansion of the United States. The same cause influenced the prices of pig iron, which fell severely in 1894, as did the other four metals, simply because the crash of 1893 curtailed construction and manufacturing for the year or two following. Since then the country has seen a wonderful growth; copper, lead, zinc, and tin have benefited directly, and if the price of iron has not been as regularly on the increase, it is because of artificial conditions created by the tariff and the combination among the big ironmakers. The discovery of new ore deposits seems to have disturbed prices hardly at all, the exhaustion of mines having balanced the opening of new ones. In tin, the scarcity of the ore has produced an excessive rise, it is true, and in zinc, the discovery of new processes to treat low-grade material appears not yet to have overstocked the market; in copper and lead, the demands of manufacture have distanced production, despite increasing skill in extracting the metals from their ores. Particular conditions affecting the individual metals do not obscure, they only serve to emphasize, the broad fact that their value rises concurrently as the demand for them is created by the industrial growth of this and other countries.

By the Way.

In a little pamphlet entitled 'The Business of Contracting,' Mr. Ernest McCullough gives advice, some of which is applicable to mining operations. He says:

A good foreman—if he is not good he should not be employed—is a man who thoroughly understands the work in hand and who understands human nature. He must be able to get a day's work from his men and still keep from quarreling with them. If he is generally called by his first name by his men, and is found to go with the crowd to the nearest saloon at quitting time, it is doubtful if he ever gets the best results from the men under him.

Sympathy is a good thing, but the possession of a soft heart is bad. The frequent hearing of 'hard luck' stories from his men is a bad thing for 'the boss' and his interests. The labor unions recognize this when they say a man is outside the union when he is a boss.

A first-class foreman is generally 'Mr.' to his men. They know they can go to him with a recital of real troubles connected with the work and that he will make an honest attempt at relief. They know that family troubles are not to be mentioned to him. They know he has no patience with a man who is continually voicing his hard luck and troubles, for it all delays work, and he is employed to expedite work. They realize that he knows fully what a good day's work should be and that each man in the gang must give it or be fired. The feeling of the men may be one of respect, but it is certainly not love. Expressions of regret when he leaves are sincere only in proportion as their forecast of the character of the new foreman is favorable or unfavorable.

It is the foreman who makes the money on a job, and it is the foreman who loses it. Therefore the manager should be a judge of men, a thorough man in his knowledge of the business, and he should always insist upon documentary evidence when hiring a foreman.

The frittering away of small sums counts terribly. Good foremen are nearly as scarce as the proverbial hen's teeth, and it is unfortunate that the majority come from walks of life that forbid any intimacy or great show of friendliness on the part of their employer. Few of them are strong-headed enough to stand it. It is a fact that a foreman is seldom worth his salt after the second job and must be gotten rid of and go to work for some one else. If he is worth keeping for a third job he is likely to have in him qualities which will lead to his being safely intrusted with more important work or which will enable him to secure backing to go contracting for himself.

Many contractors lose money because they are under the domination of old employees, although they will not admit a fact which is patent to all their friends and sometimes to the most casual observers. The writer is not hard-hearted, but he never sends for a man when a new job is secured. If a man who has proven himself asks for a job he will give it to him. It is poor policy to send for a man and give him the idea that he is indispensable. It is well to be appreciative, but to too many men an appreciative pat on the back goes to the head like champagne. There should be a systematic method of keeping track of work done, so a daily comparison can be made of work done by different men.

It is good for a man to know his efforts are fully noted. He feels sure then he is getting a square deal and devotes his time to doing his work well and does not waste time trying to "get a stand-in with the old man."

Having carefully selected a foreman by examining closely into his record after sizing him up, the contractor must give him absolute control over his men. Never interfere and hamper him in any way. Keep close tab on all he does and insist upon him getting full value out of his men. Look to him for results, and, if they are unsatisfactory, let him go in a hurry. When money is being lost on a job it is lost quickly. The writer respects his foremen by never sending to any gang a man fired from another. 'Fired from a gang, fired from the job' is the rule except in particular cases. It has happened that a foreman and some man in his gang have disagreed so that the man is fired. The foreman, however, has been manly enough to intimate that the trouble is personal and the man might work well somewhere else. When such a thing happens the man may be sent to another gang. Where such a rule is not observed, chaos would reign and no gang would be contented—the foremen least of all.

A foreman, like any workman on the job, should be spoken to only twice if he is not giving satisfaction; the second reproof to come in the form of an invitation to 'come to the office.' It should also be the last time he will ever be seen in the office of that employer. Sometimes a foreman over a certain gang seems to be lessening his output, but at the same time seems to be as earnest as ever. Before letting him go it is well to shift him to a gang of strange men. If the men are staying contentedly with a job it is bad policy to leave a foreman over the same men too long. As the men get better acquainted among themselves it often happens their efficiency is increased by reason of good-natured, friendly rivalry. If the men get too well acquainted with the foreman, or the foreman with them, there is a lowering of efficiency. A shifting of foremen occasionally is good, like the changing of the beats of policemen.

IN the afterword which Winston Churchill substitutes for the ordinary preface, he states the truth exemplified in 'Coniston,' his latest novel: "Self-examination is necessary for the moral health of nations as well as men, and it is the most hopeful of signs that in the United States we are today going through a period of self-examination. We shall do well to ascertain the causes which have led us gradually to stray from the political principles laid down by our forefathers for all the world to see." A little later he adds: "To use a figure suggested by the calamity which has lately befallen one of the most beloved of our cities, there is a theory that earthquakes are caused by a necessary movement on the part of the globe to regain its axis. Whether or not the theory be true, it has its political application. In America today we are trying—whatever the cost—to regain the true axis established for us by the founders of our republic."

THE reproach has often been made that mining in the United States has been characterized by the most outrageous robbing of the deposits. That reproach is not now justified to the extent to which it was when gouging a mine to get rich over night was a very widespread practice. But the country at large, as the owner of the mineral resources of the public lands, has not only the right, but it is its duty, to check any such practices which dissipate a national asset. No private owner of mineral land in our older States, like Pennsylvania, will lease his land to one who exploits its mineral without stringent rules providing that the miner operate it in a workmanlike manner. The Government, as a partner in the enterprise of utilizing the mineral deposits of the national domain, should not alone draw a fair revenue, but should also act as a guardian of that mineral wealth against the reckless waste which has taken place in the past and against the indifference to the future which is only too common even today.—*Iron Age.*

Special Correspondence.

LONDON, July 4.

At the last general meeting of St. John del Rey Mining Co., one of the directors mentioned that 60 years ago his father joined the company. From that time either his father or he had continuously held a seat on the board. They had seen three mines opened and two of them destroyed, and there had been many ups and downs in the price of the shares, which they had seen go up to £4 and down to 6d. For a mine of such longevity and 4,000 ft. deep, the record might reasonably be drawing to a close, but the chairman, in moving the adoption of the report and accounts, was able to show that the mine still had something to say for itself. In the past five years they had rejected on an average 6.3% of the mineral raised, and had crushed an average during each of those years of 148,000 tons. The gold taken from the mineral had realized £284,000, the yield per ton being 38s. 3d. Out of the profits each year they had averaged £11,000 on development and improvements of various kinds, and the balance of profit available was £61,000, with an exchange that averaged for the period 13d. per milreis. In the three years preceding, the average yield was 53s. 4d. per ton, and from the profit the average expenditure in development and work, some of which had fairly been charged to capital, was no less than £36,000, instead of £11,000; and yet there was a profit of £109,000 per annum. The exchange, however, was only 8d. But it was more than a question of exchange; it was well to remember that they had had poor mineral before in the long history of this mine. The latest advices from Brazil led them to infer that there were prospects of improvement. In the bottom of Level 14 there was a fair length of as good mineral as ever they had, and there was also an appearance of better mineral in the western end. The manager, Mr. George Chalmers, looked upon this as the apex of two good bodies, and when they went lower and were in the 15th level, the chairman said, they would know all about it. At all events, he, personally, was not in the least discouraged, bearing in mind that they had reserves amounting to 1,000,000 tons, and if they deducted 10% for rejection, they still had 900,000 tons of ore developed, and the whole of that development had come out of profits.

Another mining company of long standing, the Montana, held its annual general meeting—the 25th—last week. The chairman, referring to the litigation with the St. Louis Co., said he thought the shareholders must have been as surprised and as disappointed as the directors were when, after several days' trial, the jury awarded the sum of $195,000 as damages against their company in respect of trespass on the compromise ground, and of ore supposed to have been gotten and worked out of the disputed area. They were advised that this decision of the jury was based upon misdirections in law, and that, in any case, the amount of the verdict was out of all proportion to the real damage. They thought, as in the past, they would receive substantial justice from the Superior Court of the United States, and with that object, they appealed to the Appellate Court of San Francisco. To enable this appeal to proceed it was essential to deposit security for the amount of the judgment. Fortunately, their policy in the past, of accumulating surpluses, enabled them to deal with the situation promptly and satisfactorily. They had lodged security for the necessary bond by depositing over £35,000 worth of cash assets, so that when the appeal was decided, if the judgment was in favor of the company, their funds would be released, and there would be ample in hand for development purposes. Turning to the work of the past year, the chairman pointed out that the Drumlummon mine, as a producer, had nearly ceased to exist. The few lessees at work extracted ore to the value of $35,000 only—a pitiable amount when compared with the big output of former days. The tailing plant had been their great source of earning. They had treated nearly 77,000 tons, which had realized $150,000. The value of this tailing had been steadily diminishing, so that a profit of only 70c. per ton resulted from their treatment, as against $1.35 in former days. With regard to the Nevada property, the development continued, and they had been able, out of the profits of working, to pay the cost of this development, which exceeded £5,000, and to leave nearly £2,000 surplus. Their total charge on capital account to the Edgemont mine during the past year was only £1,200. They had treated 17,600 tons of ore for $6.94 per ton; while the working expense was $4.91, leaving a balance of $2.03 profit per ton. In concluding his remarks, the chairman said it would be seen they had changed the centre of interest from Marysville to Edgemont. They had got, after many disappointments, a property which promised to produce a reasonable profit upon a reasonable expenditure of capital,

During the last financial year, the total receipts of the Progress Mines of New Zealand, Ltd., from bullion and other sources, amounted to £99,676; after deducting the expenses, a profit was left of £29,595. A slightly larger tonnage has been treated during 1905 than in the preceding year, the mill-rock crushed being 60,000 tons. The yield is less than last year, and the working cost is higher by 7d. per ton. The engineer, after making allowance for non-payable quartz, estimates the tonnage in sight in December last at 90,000 tons. A large amount of exploration work has been carried on at the 10th level during the last two years, with the object of finding the orebody, but the reef is broken and the ore patchy. Finally, the shaft had been sunk to another level, and a long cross-cut made to intersect the reef; the engineer now reported that the lowest level, has, so far, opened up in a promising manner, rather better than expected. The assays from one of the drifts are stated to average 11.59 dwt., in other parts varying from 1 dwt. to 24 dwt. per ton. Attention has been devoted during the year to the question of improving the extraction from the slime and concentrate. Mr. Alfred James has recently been at the mine to study the question. A large number of experiments are being conducted at the mine, as well as in London, on both the concentrate and slime, and improved results are expected.

The directors of Camp Bird have issued a report for the half year to April 30. During this period the mill crushed 29,080 dry tons of ore, and the profit at the mine amounted to $538,437. The amount expended on construction was $5,291 and on re-construction $6,648. Dividends No. 17 and 18 were paid, absorbing £82,000. Cubic feet stoped, 261,009. Development work: In drifts 2,085 ft., raises and winzes 720 ft., and shaft No. 1 was sunk 247 ft. It is intended to sink to a depth of 937 ft. before opening out at the sixth level. Of the ore treated during the half year, about 41% was withdrawn from reserves in stopes. All work was suspended at the time of the snowslide on March 17, at which date the total ore broken in the mine amounted to 120,477 dry tons.

The estimated profit of Esperanza (Mexico) for the month of May is £80,656 as against £56,427 for April. Development work, 945 feet.

The Central Zinc Co., Ltd., has been started under good auspices, and with every prospect of becoming an important and successful enterprise. In the formation of the company no outside subscriptions were invited or accepted and an arrangement was made with Anthony Gibbs & Sons, who are the largest shareholders in the Sulphide Corporation, that they should underwrite free of charge to this company any shares which might be otherwise unapplied for. Of the 150,000 shares at £1 each, 110,000 have been subscribed for by the general body of Sulphide Corporation shareholders and the balance by the underwriters. The company is already operating a small plant at Swansea, and it is reported that arrangements have been concluded between the company and the Tees Conservancy Commissioners for the acquisition of a site near the mouth of the River Tees, north of the delta covering approximately 30 acres. The smelting works will give employment to between 500 and 600 men. They will deal, in the first place, with from 40,000 to 50,000 tons of zinc concentrate annually. Their output will be spelter and sulphuric acid, and it is expected that within a short time of starting operations, they will be in a position to duplicate their works. The ore, which is derived from the Broken Hill district, will be obtained from the Sulphide Corporation. Mr. H. M. Ridge, who has had considerable experience in the handling of Broken Hill ores, has been appointed general and business manager, while Mr. Emil

Herter, who has had a large experience in zinc distilling in Upper Silesia, has been appointed metallurgist and technical superintendent. Some trained furnace-builders have also been brought over from Germany on Mr. Herter's advice. A new industry will thus be created in the northeast of England, where larger quantities of spelter are employed.

Cornwall is not South Africa and the report of His Majesty's Inspector of Mines is not a Coolie re-patriation notice, otherwise the Home Office Blue Book, containing the report in question for 1905, would probably have been issued at an earlier date. In view of the increased activity in tin mining, the work-people employed make up a total less than might have been looked for. The average number of all ages underground for the year in Cornwall was 3,508, and above ground 2,770, which included 217 females. The Inspector (Mr. Joseph S. Martin) states that at the present time none of the tin mines are what can be called rich; but the price of the metal makes up for the deficiency. It used to be said that tin should be about £95 per ton, in order to enable Cornish mining to be moderately remunerative, and with lodes giving about 60 lb. of tin to the ton of stuff, that price should be satisfactory. The present general run of the mines is from 32 to 40 lb. of tin per ton, which, at the present price of black tin, works out pretty much the same. Mr. Martin reminds us that history is wont to repeat itself, and that in 1887 and 1888 the same prices were attained, and followed by a large slump from £170 to £78, in the latter year. The Inspector's report is of special interest at this time and merits a further notice in this correspondence.

JOHANNESBURG, June 18.

Political questions are uppermost in men's minds today. Before the end of the year it is probable that the Transvaal will launch out under responsible Government. The British are much exercised over the prospect, for it looks as if the Boers will gain a majority. This depression has driven and is still driving, thousands of British voters from the country at a time when they are most wanted. The British still remaining are by no means united. The Boers, on the other hand, will present a solid phalanx. It is feared by many that the policy of the Boers, should they get into power, will be to play a waiting game. If they can continue the depression by driving away the Chinese and so get rid of the uitlander, they will be pleased. Their policy will be against the mining industry, some people declare; but I do not think these gloomy forebodings will come to pass. The Boers know perfectly well that without the mining industry the Transvaal would soon be a bankrupt country. They will play their anti-Chinese card with consummate skill, and hold this bogey over the industrial community. Probably the outcome will be a compromise between the parties. The Boers will consent to Chinese labor, provided their language is given recognition and they are allowed a big say in the educational questions of the country. Meantime the uncertainty of the political situation causes grave apprehension. Most people realize that without Chinese labor, expansion for the present is out of the question. It is feared that the new regime might vote against Chinese labor. The feeling of uncertainty is such that the record output for May of 461,202 oz. gold for the Transvaal has not cheered people much. There was an all round improvement, and at the present rate of working it is highly probable that the gold output for June will be over £2,000,000.

Another attempt is being made to do something with the Transvaal mineral industry, other than gold. This time it is asbestos. The Consolidated Gold Fields of South Africa have taken over from a syndicate an asbestos proposition. That this influential corporation has exercised its option is good evidence that the property will prove a payable one. The 'Sallies' scandal, however, has so unnerved people that they look askance at the mere mention of new enterprises.

The position of 'Sallies' has not improved The latest returns are disheartening. Unless there is a speedy improvement, the 'Sallies' tin mine will be forced to close down. The most inexplicable thing in the whole wretched affair is the report on the property by Mr. R. J. Frecheville, whose big reputation as a mining expert induced many conservative people to consider 'Sallies' a promising proposition. The returns by no means bear out his report.

Progress is being made with the extension of the Johannesburg municipal electric tram-lines; before long the city will be well supplied with cars. This will be a blessing, as the chief reason heretofore for the exorbitant rents has been the poor transport service, consisting of obsolete horse-cars and dirty cabs. Had the electric trams been running ten years ago, as they should have been, thousands of pounds would have been saved to the mining community.

TORONTO, July 13.

The discovery of gold at Opastica lake, 75 miles north of Ville Marie on the Quebec side of Lake Temiskaming, has thrown Cobalt completely into the shade for the time being. The point of departure for the new scene of activity is the old French village of Ville Marie, a typical Quebec settlement, the neighborhood of which has for long been known as rich in mineral resources. Messrs. Renaud and Ollier, the fortunate prospectors who made the find, are residents of Ville Marie, and set the whole community wild when they returned from the north with samples of quartz carrying gold grains the size of peas. The French Canadian is usually regarded as a somewhat slow and unenterprising citizen, but there was nothing slow about the gait of the Ville Marie people when the news got around; quite otherwise. The prospectors returned with their samples to Ville Marie on July 6, arriving home at 5 P. M. By six o'clock a company had been organized and the president had left for Quebec city to secure 22 square miles of the territory adjacent to the find. Then the general rush set in—or rather two rushes. The poor prospector packed his kit with all despatch and struck the trail for the north. The well-to-do speculator put a wad of bills in the seat of his pants and took the first train for Quebec to secure a blanket claim. The law of Quebec Province differs essentially from that of Ontario. No discovery is needed to secure a mining claim, and anyone can take up as much land as he chooses by paying at the rate of $5 per square mile. This secures him absolute possession for three months, and he can renew at the end of that term, giving the wealthy man a chance to blanket a large area, select the most promising spots, and do prospecting work at his leisure. Thus the whole territory for many miles around the Lake Opastica find has already been covered by these blanket claims and the poor prospectors who have gone in numbers from Ville Marie as well as from the Cobalt camp and other parts of New Ontario, will have very little chance in that neighborhood.

Cobalt is rather under a cloud at present so far as investment is concerned, or the development of new properties, by reason of the disquieting effect of the judicial decision against the White Silver Mining Co., their leases having been declared forfeited on the ground of fraudulent affidavits of discovery. Other large companies are in danger of having their titles attacked and the uncertainty of the situation has a disastrous effect in discouraging any heavy outlay on Cobalt properties until the question is finally settled. The stock market has been very dull lately, buyers having taken the alarm. There are a large number of actions against the Temiskaming & Hudson Bay, one of the oldest shipping companies, hanging fire, awaiting the decision of the Attorney General, whose consent must be obtained before suit can be brought.

Fresh discoveries on the Montreal river are reported. Samples of pure native silver have been secured from a claim about three-quarters of a mile east of Portage bay, giving promise of a rich mine. Ruby silver has been discovered between Gillies depot and Latchford.——The Wabi Cobalt Silver Co., when trenching on a new vein on its property in Lorraine township, struck a rich body of ore about two feet down carrying pure silver.——A. A. Cole, late engineer and assayer of the War Eagle and Centre Star mines, of Rossland, B. C., has been appointed expert mining engineer to the Temiskaming & Northern Ontario Railway Commission, entering on his duties August 1. In that capacity Mr. Cole will have supervision of the mining leases under the control of the Commission and see that the conditions are properly observed by the lessees.——A syndicate of Bal-

timore capitalists has purchased the White Lily mine in the Atikokan gold range from Messrs. Manion and Murphy for $30,000, and will put up a $10,000 plant.

DENVER, July 16.

Denver has put on her gala attire to welcome the Elks, who hold convention here this week. Political squabbles are relegated to second place, and the whole city seems bent on a good holiday.

Some fellows have laid out a town-site at Ilse and called it Spaulding. They have a pretty fair hot-air machine working over time at the town-site, but it looks and sounds trifling to one who has seen and heard some of those modern, improved, quadruple-expansion, hot-air engines at work on new town-site schemes in Nevada. I do not mean by this that I think there are no mines at Ilse—I have already stated that I thought the prospects favorable. The recent reports from the camp have, however, so evidently originated in the office of the town-site company that many people have lost interest in the place; this is a poor State for town-site booms. We don't stampede readily enough. It seems to take the smell of desert sagebrush to make that sort of thing profitable.

A discovery important to Clear Creek county has been made in the Waltham mill, at Idaho Springs, in finding out that Empire ores are readily treated by amalgamation, concentration and cyanide. A great deal of low-grade ore has lain unworked in the mines at Empire for a long time because it could not be treated profitably by any of the mills in the district. The Waltham people put up a little mill to treat some ores near Idaho Springs. They were not very successful. In looking abroad for ores to keep their plant busy, they tried some Empire ores with excellent results. Shipments have been made by Cutting & Trevillion, from the Pioneer mine; by Wing Bros., from the Gold Dirt mine; and by William Poulson, from the Empire tunnel; in each case the shipment weighed 110 tons. So successful were the results of these runs that the Waltham mill has contracted enough Empire ore to keep it running to full capacity for the balance of the year, and the owners—Tanner, Anderson and Carlson—are preparing to erect another mill nearer Empire. Moreover, the Gold Fissure mine is preparing to build a mill along the same general lines. There is also talk of a pyrite smelter at Empire, in fact land has been bought for a site. Of course the promoters of this scheme may have something new and wonderful in the line of pyritic smelters, but one cannot help wondering why they do not buy one of the plants that are already built; they could get their experience so much cheaper that way. There is also to be erected at Idaho Springs a new style smelting plant that will treat all kinds of ore for 40c. per ton. The hot-air blast is probably an important feature of this process.

Several rich discoveries have been made near Georgetown. The most important is the strike in the Sunburst, which is described as 2½ ft. of stuff that carries 600 oz. silver, 25% lead and some gold. F. L. Peck and D. W. Shepard are the lessees who made the discovery.——I noticed a couple of new locomotives going up the canyon for the new East Argentine railroad the other day. They were of the type that has three vertical cylinders on each side, the crank-shaft of which is geared to the drivers.

This year has been singularly barren of important mining transfers, so the news that a deal of some magnitude has really been closed at Central City is interesting and refreshing. Report has it that a party of Eastern men were brought out to Central City by Mr. Thompson, manager of the Fifty Gold Mines Co., and that before they left they took 600,000 shares of stock at 50c per share. Good work, Mr. Thompson! Any one that can sell 600,000 shares of stock in a Colorado mine this year must be a rustler.——They keep striking oil in new wells up in the Boulder field. Nearly every week I notice a little three-line article to the effect that so and so has got a flowing well. It would be a strange thing if that field should turn out to be a big thing, after its disastrous early history, and the hard turn-downs it has got from some of the wise ones. New and important strikes of oil in the Florence field ceased to interest the public years ago because they were all made by the United Oil Co., which simply meant more money for Rockefeller and the Hill estate, but today comes the welcome news that Phillip Griffith, an independent operator, has struck a big flow at the depth of 2,400 ft.——There is more going on over at Red Cliff this year than for many a long year. This is due to the discoveries in the East Battle Mountain belt, and to the reopening of operations on the fissure veins of Eagle canyon.

At Cripple Creek a very important discovery has been made in Cresson Consolidated by Richard Roelofs, superintendent of the Bull Hill Mining & Development Co. He has lately opened up the big shoot of ore at the 700-ft. level, and finds it larger than ever. It is said to be 50 to 60 ft. thick—its length along the vein has not been determined as yet. The value is given as $20 per ton.——The recent discovery in the Acacia is holding out better than anticipated. From the bottom of the Burns shaft (800 ft. deep) a crosscut was made revealing six feet of ore, two feet of which averages $360 per ton.——John T. Milliken, of the Golden Cycle, has bought 11,000 acres of land, including two coal mines, from the East Colorado Springs Land Co. The deal is the largest that has been consummated in El Paso county for several months. The consideration is given as $200,000. This is the second case I have heard of, where a gold mine has bought a coal mine to insure a cheap coal supply for metallurgical purposes. The Camp Bird Co. bought a lot of coal land over in the Grand River field about two years ago. It does not mean that the coal situation in this State is so bad that operators are driven to buying coal mines to protect themselves, but rather that coal mines are so plentiful that a fellow might as well have one if he has any use for the product.——The developments in mining for tungsten in Boulder county are so good that the buyers estimate the value of the product will add another million to Colorado's mineral output this year.

CALUMET, July 14.

Every effort is being made to place the Winona mine in condition to produce ore. The principal work is the preparation of stopes in the ground tributary to No. 3, which opening will be the only source of production for the first few months. The sinking of No. 4 shaft to the fourth level will also be pushed. It is likely that the Winona's output will be handled at the Atlantic stamp-mill. That plant treated the Winona rock formerly, and as the Atlantic has no use for its mill at the present time, arrangements can easily be made. At the new No. 4 shaft a depth of 40 ft. has been reached. It is expected that the shaft will be opened to the third or fourth level in three months, as raising on the line of the shaft is in progress to meet sinking from surface. The raises will be started at the third and fourth levels, where cross-cuts are now being driven to the line of No. 4 shaft from the drifts extending to that point from No. 3 shaft. Several other drifts are being driven southward from No. 3, but the longest of them lacks several months' work of reaching the line of the new shaft. At the eighth level, the deepest in the mine, the drift south from No. 3 shaft is in 450 ft. The sixth level is ahead of the eighth, and the fifth and seventh levels south are the same length.

Owing to the scarcity of experienced millmen, the Victoria has been unable to operate its stamp-mill at night. As soon as enough men can be obtained rock shipments will be doubled. Nothing official has been announced regarding the mineral content of the rock stamped. In June the product was only about 25 tons of refined copper, but this month it is expected to exceed 75 tons. Work underground is being conducted with a view to enlarged production. The openings are nearly six miles in extent, and it is estimated that sufficient rock is blocked out to feed one head at the mill for four years. While it is not expected that the ore will average high in copper, the low operating costs resulting from the Taylor hydraulic power-plant should make the property profitable. Everything about the mine and mill is now being operated by means of power generated from the plant at Glenn Falls.——Since the Michigan has made arrangements for sending its output to the Atlantic stamp-mill, the Mass Consolidated will soon have the use of the head in its own mill that will be released by the former company. As the Mass Consolidated Co.'s new C shaft is

in use and rock shipments by rail are regular now, it can supply rock to a second head. The shaft is capable of furnishing enough ore to feed the other stamp.

Captain John Peterson, who up to a short time ago had been in charge of operations at the Winona mine since its opening under the present company, has been appointed mining captain by the Hancock Consolidated Co., and will be in charge of the underground work. The Hancock Co. is organizing its executive staff. A number of heads of departments at the Quincy mine have accepted positions with the new corporation. —— The result of the stockholders' special meeting of the Quincy Mining Co. called August 8, in New York City, to act on the proposition of increasing the company's capital stock, will be awaited with interest, as the Hancock Consolidated Co.'s territory would prove particularly valuable to the Quincy.——The showing in the Adventure Consolidated Co.'s new No. 4 shaft continues to be excellent. The work at that point is being deepened steadily and there is no diminution in the copper content of the ore.——Sinking in the new shaft of the Superior property, in Section 15, is progressing, and the showing is better than was made at the same depth in No. 1 shaft. In the latter, sinking is now in progress to the fourth level. —— Operations will be started by the Caldwell Copper Co , a subsidiary concern recently incorporated by the Calumet & Hecla interests, as soon as a diamond-drill outfit arrives. The tract to be explored adjoins the Rhode Island, and is traversed by the Kearsarge amygdaloid formation, as well as other lodes. —— A core recently extracted from the diamond-drill hole of the Isle Royale Co., north of the new shaft, in Section 11, revealed excellent copper ore for a thickness of eight feet. The drill is being removed to a point south of the shaft where another core will be bored into the Isle Royale amygdaloid.——John L. Harris, superintendent, has put men to cleaning up and repairing around the surface of the Hancock Consolidated Mining Co.'s property. The necessary machinery for starting operations is being secured as rapidly as possible, and it is expected that the unwatering of the shaft will be begun in a short time. The Mineral Range railroad is preparing to build a spur to the mine. The old shaft and rock-house which surmounts the Hancock shaft will be torn down and replaced by a large modern structure, probably this summer. The timbering around the collar of the shaft will be repaired, and as the workings are drained of their many years' accumulation of surface water the timbers will be renewed.

A final dividend of $1.643 per share in liquidation of the Dakota Mining Co. has been declared by order of the Houghton County circuit court. The company has 20,000 shares and the dividend represents the proceeds of the sale of the property owned by the corporation, which brought $36,000. All that is now necessary for the holders of the old stock is to file it with the county clerk of Houghton county and he will pay what is due. It was decided two years ago after the corporate life of the company had expired, to wind up its affairs and declare a final dividend after the remaining property was sold. The matter went through the machinery of the court with the above result. Persons who saved their certificates of Dakota stock, which was considered worthless, will thus profit by their precaution.

Several parties of students and professors from Eastern mining colleges have been visiting the Lake Superior copper district the last few weeks studying mining, milling, and smelting methods in vogue at the local properties.

SALT LAKE, July 16.

A meeting of shareholders of the Mammoth Mining Co. called for July 14, has been adjourned to August 4, when the matter of transferring the property of the company to a proposed new corporation to be organized under Nevada laws, will come up, the object being to obviate State courts. The Yerington Copper Co, has been organized here to operate in the Walker River mining district, three miles north of Yerington, Nevada. The incorporators are: Charles N. Strevell, president; Joseph E. Caine, vice president; C. D. Rooklidge, secretary; H. P. Clark, treasurer; who, with James H. Patterson, S. V. Derrah, D. E. McPherson, H. C. Edwards and L. R. Martineau are directors; they are Salt Lake men. —— During last week on the Salt Lake Stock & Mining Exchange, 203,501 shares of stock were sold for $140,125, against 83,712 shares for $23,984 during the corresponding week a year ago.——The Boston Consolidated Mining Co. will operate two shifts with the steam-shovel at its Bingham properties. A machine is now removing overburden and is handling between 1,500 and 2,000 tons per shift of 10 hours.——F. Augustus Heinze has not stated, as yet, to what extent he is interested in the Bingham Consolidated Mining & Smelting Co. He has visited all the mines and the smelter of that corporation and attended a special meeting of directors, at which Duncan MacVichie was made director, and H. L. Charles, of Butte, a member of Mr. Heinze's staff, was named as general manager. At this meeting, $400,000 was ordered set aside for smelter betterments. Mr. Heinze has secured an option on a control of the stock of the Ohio Copper Co., and has agreed to expend $50,000 in development of the Bingham property of this corporation. The Ohio mill is handling about 200 tons of ore per day, nearly all of which is mined in development.—— The Phœnix mine at Bingham is being examined by engineers, who are said to represent parties who hold an option on the property.——The Holderman Filter Tank Co., of Salt Lake, which has a lease on the Manning mill-dump of the Consolidated Mercur Gold Mines Co., will start its new plant at Manning, Tooele county, this week. It was built to treat 120 tons daily. The dump contains 800,000 tons, which, it is estimated, will assay $2.50 per ton. The Holderman people claim that 80% can be saved by their method of treatment.——The Honerine mine at Stockton has resumed production, the ore being taken from the mine through the drain adit. The mill has also been started. The company has expended $1,250,000 in preparation and has an indebtedness of $350,000.——Several mines of the Tintic district have reported dividends for this month. They are: Mammoth, $20,000; Carisa, $5,000; Uncle Sam Consolidated, $5,000; Beck Tunnel Consolidated, $25,000; Grand Central, $15,000, and Victoria, $10,000. The Utah mine of Fish Springs pays $2,000.——Mine owners of Bingham and other camps still complain of a labor shortage, and the construction of the Garfield smelter, and the mills of the Boston Consolidated and Utah Copper Co. has been retarded. The smelter, however, is almost finished, and by August 1 the management expects to have the plant in blast.

Control of the South Columbus mine at Alta has been secured by Tony Jacobson, manager of the Columbus Consolidated Mining Co., and associates. The property adjoins that of the latter at Alta. —— Track-laying on the main line of the Western Pacific railroad is proceeding westward from Salt Lake. The rails are laid to the vicinity of the new town of Garfield, 12 miles out ——Tintic district producers have failed, as yet, to induce the transportation companies entering that camp to make any reduction in the existing ore tariff to the Salt Lake smelters, but the matter is under consideration. —— The Standard Copper Co., composed of Salt Lake and Los Angeles men, has been organized to operate a group of eight patented claims at Bingham. W. E. Hubbard, of Salt Lake, is secretary. —— The output of the Carisa, in Tintic district, is now about 50 tons per day. The ore is shipped direct to the Salt Lake smelters.——Tintic ore shipments last week aggregated 104 carloads, the shippers and amounts being: Ajax, 1; Beck Tunnel, 4; Black Jack, 7; Bullion-Beck, 8; Carisa, 7; Centennial-Eureka, 25; Dragon-Iron, 9; Eagle & Blue Bell, 8; Gemini, 5; Grand Central, 8; Godiva (concentrate), 2; Mammoth, 4; May Day, 2; Scranton, 4; Sunbeam, 1; Swansea, 1; Uncle Sam, 4; Victoria, 6; Yankee Consolidated, 2.

The Colorado Mining Co. has decided to resume development. It owns three lode claims adjoining the Bullion-Beck Tunnel mine, and is owned by those who control the latter. Jesse Knight, of Provo, is manager.——At Alta, the Columbus Consolidated ore shipments are being made at the rate of 75 tons per day. The mill is working two shifts.——In a cross-cut from the 700 station of the lower adit of the Albion Mining Co., at Alta, a contact vein has been encountered, the ore being iron sulphide. From the main adit a raise is being made to connect with the bottom of an old shaft 150 ft. above.——Development is progressing in the Wabash, in Summit county, and the manager states that the contact vein will be tapped within 300 ft. —— The output of the

Daly-Judge during July will equal that of June, when net profits of about $75,000 were made. A raise is being driven in the vein encountered in the western part of the mine several months ago. A winze is also being sunk in ore. The shoot is known to be 275 ft. long and 20 ft. wide. The mill is treating a little over 100 tons per day, but the bulk of the proceeds comes from ore shipments.

In Iron county, the Jenny Gold Mining Co. has a three-foot vein of shipping ore at Goldsprings. The company is completing the patenting of its claims and will soon be in the market for a mill. Charles A. Short, of Goldsprings, Utah (via Fay, Nevada), is manager. —— In Washington county, the Utah & Eastern Copper Co. has again started its smelter at Shem City. The plant has been closed down since the washouts of last May, when miles of the company's road was destroyed. A traction engine is used to haul freight to and from Acoma, the nearest railroad station on the San Pedro, Los Angeles & Salt Lake railroad.

BUTTE, July 14.

The Amalgamated Copper Co. is pushing development at many of its mines. Ore-bins are being built at the Berkeley and Buffalo shafts, and it is expected that ore will soon be hoisted at both mines. Development work continues at the Anaconda, Nipper, Parrot, Tramway and Snohomish mines. The Amalgamated properties are at present yielding 10,000 tons of ore daily, of which 6,000 tons are shipped to the Washoe smelter at Anaconda and 4,000 tons to the Boston & Montana smelter at Great Falls.

The Red Metal Mining Co. is now shipping its output to the Washoe smelter, including its concentrating ore. The latter was, until a few days ago, sent to the reduction plant of the United Copper Co. at Basin. This plant will continue to run on what ore can be furnished by the Lexington Co., but it is the intention to have the concentrating ore of the Davis-Daly Estates Co. treated there when that company begins production. The United Copper Co. also owns the new smelter built at Basin by the Basin & Bay State Co. some years ago, but which was never operated; the plant will be equipped so as to increase its capacity and enable it to handle the Davis-Daly and the United Copper ores. The Davis-Daly Co. had secured options on land on the Big Hole river, west of Butte, where it had intended to build a smelter, but the options will be allowed to lapse because of the arrangement just outlined.

Work has been commenced on the 3,800-ft. cross-cut which the Original Mining Co. is to drive for the Davis-Daly Co. from the 1,800-ft. level of the Original mine. It is announced also that four additional shafts will be sunk; the machinery has been ordered. Pending its arrival a temporary plant will be installed. The shafts are to be carried to a depth of 2,000 ft., and no cross-cutting will be done above the 1,000-ft. level. The company starts with a working capital of $2,000,000, and owns about 30 mines, or portions of mining claims, some of which are partially developed, while others have produced good ore in the past. C. H. Palmer, formerly general manager of the Butte & Boston Co., is general manager of the Davis-Daly operations.

F. Augustus Heinze has made his first payment of $172,000 on the Stewart group of mines in the Cœur d'Alene district of Idaho, in which he recently purchased a controlling interest. Butte mining men are increasing their interests in the Cœur d'Alene, encouraged to do so by the enterprise of Mr. Heinze.

The electricians of the Amalgamated, Red Metal and North Butte mining companies went on strike on the first of May for an increase in wages. For the first time in the history of mining in Butte the companies united in resisting the labor demand with the result that the electricians lost their strike, and a few days ago called the contest off, returning to work under the old conditions. ——A spur railroad track is being built to the Six O'Clock group of mines, which is being developed by the Butte Copper Exploration Co., for the purpose of hauling coal and supplies. The shaft is now 725 ft. deep, and sinking will be continued until a depth of 1,000 ft. is reached. No cross-cutting will be done above that point.——The East Butte Mining Co. will have its new hoisting engine ready for operation in a few days. The second shaft being sunk at the southern end of the property is the largest in the Butte district, and has been opened to a depth of 200 ft. It will be carried down 1,000 ft. and connected with the main working shaft at the north end of the company's property.

Another company is being organized in Butte to explore and develop a number of mining claims on the east side of Butte. The organizers already have under control or option about 30 claims, most of which belong to W. D. Thornton, president of the Raven Mining Co., and a heavy stockholder in North Butte and Butte Coalition companies. Only one of the properties in the group is a producer. The Bertha mine was worked by tributers, and recently they opened a good body of copper ore, but did not have a long-time lease on the mine, and shortly after the strike was made they were notified the Bertha would go into the new company and that they would have to stop work. Associated with Mr. Thornton are officials of the Amalgamated, Raven, and Butte Coalition.——In the Tzarina mine, southwest of the city, high-grade silver and gold ore has been struck, the average of several shipments being $150 in silver and $50 in gold per ton. The Tzarina is owned by James A. Murray, a banker, and is worked under lease.

The stockholders of the Butte-Milwaukee Copper Co. have elected John F. Cowan, B. E. Calkins, C. H. Smith, W. C. Siderfin and John N. Kirk directors, all Butte men, but it is understood an Eastern man will be substituted for one of those elected. A minority interest in the company was sold some time ago, and with the financial assistance thus received the company will be able to push development and take up the options on the Bird, Colonel Sellers, and Florence claims, as they become due. The company owns and has paid for the Pollock, upon which work was begun a week ago. The shaft on the Pollock is down 350 ft., but no stoping has been done below the 250-ft. point. From the upper levels, years ago, $400,000 worth of gold and silver ore was mined. The Pollock has four veins traversing its entire length, only two of which have been opened. The mine is being unwatered and the company will explore the ground at the 350-ft. level, and at the same time sink the shaft. It is the general opinion that with a little more depth the silver veins of the Pollock will be found to turn to copper, and it was because of this belief that the Butte-Milwaukee purchased the Pollock. In addition to its Butte holdings the company owns nearly 100 acres of mineral land in the Argenta district, Beaverhead county, Montana, adjoining the properties of the Butte-Argenta Co. The latter is engaged in development work which will test the value of its own ground as well as that of the Butte-Milwaukee Co. Near the surface the Argenta ores carry silver-lead ore, mixed with iron, but as depth is gained the lead and silver are replaced by copper.

There has been no change in the position of the Raven Mining Co., and from present indications it will be a long time before access into the Snoozer mine will be obtained again. The Amalgamated Co. seems determined to keep the Raven out. Its first move was to take from the Raven the working shaft, which it was using under a verbal lease, and next it made a claim of ownership of the apex of the discovery of the Snoozer, its most important vein. With no shaft and a threat of injunction proceedings, the Raven was powerless, but still its officials talked about opening a shaft on the Snoozer and sinking it to the orebodies on the 1,500-ft. level. Should the company determine to do that, there is little doubt that the Red Metal Co., which owns a small interest in the Snoozer, would withdraw its consent to the mine being worked by the Raven Co. Under the conditions it is not probable that the Snoozer will ever be worked again by the Raven Co., unless the latter becomes an asset of the Amalgamated or Butte Coalition Co. The Raven Co. owns the Raven mine, upon which there is a shaft 700 ft. deep, equipped with a good surface plant, but the Raven claim has not yet reached the producing stage, though a copper vein has been opened on the 700 level. Owing, however, to the close relationship between the head officials and principal stockholders of the Raven Co. with the leading spirits of the Amalgamated and Butte Coalition companies, it is not likely that the Raven Co. will do anything that the two other companies do not wish it to do. It seems to be the general opinion in Butte that a new company will absorb not only the Raven and Red Metal interests, but will also take in the Old Glory Mining Co., which owns a mine adjoining the Snoozer, and which has made claim to one of the Snoozer veins.

CANANEA, Mexico, July 15.

Great activity is being manifested in the Cerro Tordillo district, which is situated about 35 miles east of Cananea. There are two large companies operating there—the Brooks Consolidated Copper Co. and the Union Consolidated Copper Co. Both of these companies have developed large bodies of copper ore which assays from 8 to 25% copper and from 20 to 90 oz. silver. A syndicate of mining men has been formed to acquire ground in that district and last week denounced about 300 acres, between the properties of the two companies named above. Owing to the good showing obtained by the companies already operating in this locality, there has been a rush and a great number of small claims have been taken up in the vicinity of the larger holdings.—— The Arizpe Mining Co. has commenced development on two of its six claims and is obtaining good results. This company owns nearly 1,500 acres of mineral-bearing land 17 miles southeast of Cananea. The holdings include the Alacran, the Palo Seco, the Rey de Cobre, the Princessa, the Sevilla and the Victoria claims. A mill-run from the Sevilla gave 79 oz. silver, 4% copper and 0.5 oz. gold. A mill-run from the Victoria returned 15% copper and 20 oz. gold. Both of these claims cover large and well-defined lodes, some of which are more than six feet wide. Ore is being shipped from the Alacran claim and is giving net returns of about $70 per ton at El Paso smelter. One car a week is the regular shipment. About 500 ft. of development work has been done on the Rey de Cobre and this has exposed a large body of low-grade sulphide, which gives average assays of 5% copper.

The Picacho Gold Mines Co. is installing heavy machinery over shafts No. 1 and 2 and is setting up an air-compressor capable of running 14 drills. This is the well-known mine which the Phelps-Dodge Co. has worked for the past five years. It was bought a few months ago by the Clancy Bros., of Detroit, after an investigation of the property which lasted over six weeks. The new management estimates that there is $500,000 worth of ore on the dumps and over $1,000,000 in the mine already blocked out. This ore will be treated at the Oro Maximo mill, which is two miles from the mine, and the management is making every effort to be ready to ship 100 tons per day to the mill as soon as it is completed. The mill was designed by W. H. Holms, of Mexico City, and embodies several new ideas; it is estimated that the ore can be concentrated for 80c. per ton, and as it averages about $50 per ton, large profits are expected.

Ore assaying 18% copper has been struck in the Oversight mine of the Cananea Consolidated Copper Co. The strike is at a depth of 800 ft.; the drift is in this ore for 40 ft. and it is expected that this will develop into one of the greatest orebodies yet discovered in the camp. The breast of the drift is 6,480 ft. from the portal and will connect with Adit No. 7 in 800 ft. Ore assaying six per cent for the entire length of the drift on the 200-ft. level of the main shaft of the Henrietta mine—that is, for 160 ft.—is reported and within the next few weeks this mine will be one of the largest producers of the Greene properties. Air-drills and compressors are being installed and the work will be pushed. The building of four new McDougal furnaces and a new stand of converters will be commenced in August and it is expected that this new equipment will allow the smelter greatly to increase its output. The present reduction plant is undergoing a thorough overhauling and it is expected that it will be in first-class condition by the end of July.——

Announcement has been made privately that the America mine, owned by the American Mining Co., of Los Angeles, has been sold to Thos. F. Cole for the sum of $2,250,000 cash, and the buyers have already taken possession. A new body of chalcocite was opened up last Sunday, and subsequent work shows that it is an immense deposit and is the richest ore that has been found in this camp. About one year ago this mine might have been bought for considerably less than $100,000, but the great development under John Talbot, the superintendent, has raised it to its present value.

The titles to the Calumet & Sonora Mining Co.'s properties have been obtained and the development work will commence in a few days. These titles were obtained at the City of Mexico in the record time of 18 days.

Mining Summary.

ALASKA.

John H. Hughes has left Seattle for Alaska, accompanied by an engineer to make the surveys for a nine-mile ditch to carry water to placer property which he owns on Hearst creek in the Fairbanks district.

R. M. Oderkirk, Joe Herzog, and Charles Herzog, of Seattle, have returned to Seward from a trip to the Susitna country, and the country northeast of Mount McKinley, and report great quartz veins in that region. The ground is very mountainous but creeks afford valleys along which travel is not difficult in winter. In the summer, however, the region is frightful to travel over, owing to the lack of trails and the fierce rushing of the glacial streams whose source is on Mount McKinley. "With Government aid in establishing suitable trails in this section, it will undoubtedly prove to be a very rich mining district," said Oderkirk. Three large rivers were found, which were not recorded on any available maps. The party named three creeks in the district which they believe had never before been seen by white men. The names given to the creeks were Costello, Colorado and Ruby. On these creeks quartz claims were located by the party. The quartz contained a large amount of iron pyrite, which assays $77 gold. While the Oderkirk-Herzog party was in that district, Blankenship, Rody & Hickman arrived and located five claims.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—The Tucson, Congresso and El Senado mining claims, owned by Marcus A. Smith and L. O. Cowan, of Tucson, have been acquired by an English syndicate for $250,000. This deal was promoted by Fred Swinney, of London, who will be general manager of the property, which is situated in Sonora, Mexico. These claims are 55 miles west of Carbo, 80 miles north-west of Hermosillo, and 30 miles from the Gulf of California. A little over 1,200 ft. of development work has been done on them.

The Arizona Copper Co. has made a concession to its concentrator men who walked out recently. Instead of a 50c. cut on the eight-hour day, it has been reduced to 25c., and does not include men who get $2.50 or less per day. The offer has been accepted and all the mills are running full-force, eight-hour shifts. The new concentrator of the Arizona Copper Co., just completed, made a test run last week of all machinery except vanners and Wilfley tables. It is expected that the mill will be started about August 1. The operation of the new mill, No. 6, is under the direction of Wm. A. Moore, recently superintendent of concentrator No. 5 of the same company. Fred Marsden, who has been shift-boss for years at the Arizona Copper Co.'s concentrators in Clifton, is now foreman of No. 5. The Longfellow property, of the Arizona Copper Co. at Morenci, is undergoing improvement. Excavation is being made for a new hotel, the site of which is near, and on the same level as, the Humboldt mine. On the adjoining lot the company is preparing a free reading room for the use of its employees. An extensive sewerage system is being laid. This improvement, together with that already started by the Detroit Copper Co., will result in a much better sanitary condition in this community.——L. C. Miller, assistant forester, who recently came from Washington, D. C., for the purpose of establishing a forest nursery on Mt. Graham, this county, has men at work on an experimental station at Chlarson's sawmill. He has just returned from a visit to the Pinal reservation where he contemplates establishing another station in the near future.——The farmers and canal-owners of the Gila valley have united and engaged attorneys to bring suit to enjoin the three big companies of the Morenci-Clifton district who operate concentrators: namely the Arizona Copper Co., the Shannon Copper Co., and the Detroit Copper Mining Co., from running tailing into the river in future, and also to recover for damages already done. The tailing question is proving to be a serious one to the Gila valley agricultural section, and has been a source of much trouble between the farmers and the copper companies for a number of years. The companies have made consistent efforts to stop the large

flow of tailing into the river, and by constructing dams, have lessened it over 60 %, but still that does not satisfy the farmers.——The Detroit Copper Mining Co. has completed an addition to its ore-bins at the Copper Mountain mine, adding 40 % to their holding capacity.——Harry Hastings is chief engineer of the oil-burning engines of the Morenci Water Co. situated at Eagle Creek, seven miles west of Morenci.——The Detroit Copper Mining Co. has established a telephone system of its own with the central office in the office of the company's auditor.——The Ash Peak Mining Co. is putting in hoisting machinery and erecting new ore-bins near the Arizona and New Mexico railroad, over which it will ship ore to the Clifton smelters, the ore running as high as $375 per ton in gold and silver. It now has one shaft down over 300 ft. and has lately installed a diamond-drill which is running full time.——The Holman-Keppler property in Mayflower district is showing up well, and the Copper Hill claims in that district now have a steady force at work.——On July 10 the Twin Buttes Mining Co. shipped 100 tons of ore to the El Paso smelter. It is the expectation to increase this shipment 100 tons every three months until it reaches 500 tons. Work on the railroad leading to this property is progressing rapidly. The track is now eight miles long.——A discovery of rich copper ore was made recently on claims owned by Frank Weast in the Stanley Butte mining district. Mr. Weast is superintendent for the Stanley Butte Mining Co. whose property is situated at the head of the Goodwin canyon. These claims were formerly owned by James Booken, and are six miles from the Belle group. The orebodies just discovered are said to be 40 ft. wide and assay 25 % copper.

Morenci, July 14.

MOHAVE COUNTY.

Gardner H. Smith and son, of Pasadena, are at the Garnier mines in the Wallapai mountain.——Bob Brannock has returned to Kingman from Secret Pass, where he is interested in promising mining properties. He reports the mines proving up well.——T. E. Ludlam, of Sea Isle City, N. J., is at the Mocking Bird mine in Weaver district, looking into the matter of putting in a pipe-line and mill. The mine, under the management of J. D. Jordan, has been developing into a promising gold property.——Work is progressing on the Boulevard mine of the Sheeptrail group, 15 miles north of the Gold Roads mine. The orebody is found to be large and of good grade. It was in this mine that the old company lost the vein. It is now yielding hundreds of tons of ore monthly. The company has put on another team and is preparing to start all the stamps at the mill. W. C. Howard is superintendent.——E. Riveroll, of Chloride, is getting the smelter in readiness to start as soon as coke is received. A carload of coke is at Kingman. If this small smelter will handle the ore of the Pinkham mine successfully it is probable that a large furnace will be put in.

PINAL COUNTY.

(Special Correspondence).—The Bryan group of mines at Florence, has commenced regular shipments of ore containing 15% copper to the Humboldt smelter in Yavapai county.——Henry Thompson, of Globe, accompanied by several mining men from Gila county, was in Superior district most of last week negotiating for bonds on a number of mining properties.——The Woodbury brothers have named their camp in the Rogers district, Woodbury Park. They have incorporated the Superstition Mining Co. to develop and operate a group of lead-silver claims situated in the Superstition mountains, 40 miles north of Florence. The properties to which they have acquired title have yielded a great deal of rich silver ore in the past.——Last week George B. Chittenden, general manager of the Saddle Mountain Mining Co., paid into the land-office at Phœnix, $16,000 for 800 acres of coal land, covering the lower basin of Deer creek. Mr. Chittenden had previous to his purchase developed a bed of good coal, five feet thick. Tests proved this coal to be first-class fuel, as well as good coking coal. The Saddle Mountain Co. will install coke-ovens, as it is only 12 miles from this coal-bed to its smelter at Christmas. The grade for an electric railroad between the two points has been completed and the track and pole-line will quickly be placed. When this and the coke-ovens shall have been pleted the Saddle Mountain Co. will double its furnace capacity, as it has sufficient ore in sight to justify it.——W. G. Ham, of Florence, went to Goldfield district the past week to take down the old Bull Dog mill of 10 stamps. It will be removed to Ray, to be erected on the property of the Big Lead Co. to crush for concentrators.

Phœnix, July 14.

YAVAPAI COUNTY.

Within the past year the revival of the mining industry in that part of the Hassayampa mining district lying south of, and tributary to, Prescott has been noticeable and the shipments of ore from the different camps have been continuous.——South from Prescott the Cottonwood Copper Co., on Groom creek, is shipping ore. A small force is employed.——In this neighborhood arrangements are being made for resuming operations on the Ideal mine.——At the Senator adit, near Mt. Union, miners are sinking the Treadwell shaft to connect with the adit, and the driving of a drift on the Ten Spot vein is progressing.——On Mt. Union the Storm Cloud is being developed by the H. J. Beemer Co., and results are satisfactory. Ore of the average value of $50 per ton in copper and gold is being mined in the adit, where the pay-streak shows an average width of three feet. This company is also sinking the shaft on the Ten Spot vein, rapid headway being made there, since the installation of the compressor and power-drills.——In the Slate Creek district there is a large amount of high-grade ore on the dumps of the Dunkirk mine, ready for shipment to the Humboldt smelter.——On the Davis vein men are driving the adit and sinking a double-compartment shaft to connect with it.——The Mt. Union Consolidated Mines Co. has a large force at work, and two miles east Harry Ames is developing a promising property from which high-grade ore is being extracted.——In Crook canyon the Juanita Mining Co. is driving two adits along a vein from which ore of good grade is being taken, and A. B. Spence is developing a gold-bearing vein.——Lute Wilson, whose claims are near Crook and Mt. Union, is taking out high-grade ore.——Near the Blue Dick, J. R. McDonald has a four-foot vein of $20 ore in the adit on the Mark Twain mine, which is an extension of the Blue Dick. A number of prospectors and miners are sending enough rich ore to market to continue development of their prospects.

CALIFORNIA.

AMADOR COUNTY.

(Special Correspondence).—During the past few days there has been an unusual number of accidents in mines along the Mother Lode in this and neighboring counties, some of them fatal. Two men employed in the App mine, at Quartz, were caught in a cave, on Tuesday of last week, one of whom has since died from injuries sustained.——In the Argonaut mine, at Jackson, a few days ago a miner narrowly escaped death by a cave, in which he was seriously injured.——At the Gwin mine, in Calaveras county, on Friday of last week, a miner fell in a stope, and was seriously hurt, and at the Kennedy mine, near Jackson, S. Garbarino was injured by a cave on Friday. Monday, July 16, a miner was killed by falling down a shaft at the Eagle-Shawmut mine, near Chinese. This is a greater number of accidents, within a few days, than usually occurs along the Lode in a year.

Jackson, July 17.

CALAVERAS COUNTY.

It is reported that the Morgan mine, on Carson hill, five miles south of Angels, owned by the James G. Fair estate and Louis Irvine, will soon be re-opened after an idleness of many years. It has been shut down through litigation. The same parties, it is said, will re-open the Crystal mine, at Angels, near the Lightner.

EL DORADO COUNTY.

(Special Correspondence).—White and Davis, six miles from Shingle springs are taking out some good ore and crushing it in their two-stamp mill.——The Jasper Mining Co. will soon have its three-stamp mill completed.——Grainger & Wallace shipped 11 lb. of gold in their last clean-up at the Davidson ranch drift mine.——The Pyramid Mining Co. will continue the shaft from the 500 to the 1,000-ft. level. The vein is from 10 to 12 ft. thick. The 15-stamp mill will be replaced by one of 40 stamps.——The Union mine is operating with a small force.——Seymour Hill, at

the German mine, five miles from El Dorado, is doing development work.

El Dorado, July 16.

William Cole and son, who took several thousand dollars a few days ago in the Golden State mine near Georgie Slide, have sublet their lease to Clifford Cheek. W. J. Davey is working the interest of G. Smeder, in the mine.——C. Cobb and R. Morris have placed a steel whim on the Railroad Hill mine, three miles from Greenwood.——The California Jack mine, three miles south of Georgetown, has been bonded by the company now working the Alpine. It will develop the mine, and the work of reconstructing the old mill has commenced.

INYO COUNTY.

The scene of one of the latest stempedes is to the Wild Rose district, also known as Emigrant Springs, situated in this co u ty about 16 miles from the line of Nevada, on the west side of Death valley and on the east slope of the Panamint range. In the early history of that district ore was shipped from Panamint to San Pedro, via Los Angeles, and thence to San Francisco for treatment. The rush to the Wild Rose district is not very big as yet, owing to the intense heat of that region during the summer months, but with the coming of fall all who have not already made fortunes in southern Nevada camps, and a few who have, may be expected to visit the new field of excitement.

LOS ANGELES COUNTY.

The Union Oil Co., of Los Angeles, announces that the company has signed a contract with parties in Chile for 10,000,000 bbl. oil to be delivered within a period of 10 years at the port of Iquique, in the State of Tarapaca. About a dozen companies in the nitrate field will use the oil for fuel, and railroad officials in that country have announced their intention of putting oil-burners on the engines of their roads. The company will use foreign tank-steamers to transport the oil, the delivery of which will commence this fall. The Union Oil Co. also announces that it will begin the shipment of its product to the Isthmus of Panama within the next 60 days. The oil will be stored in four tanks having a capacity of 200,000 bbl., at each end of the Panama railroad.

MARIPOSA COUNTY.

On Cox creek half a mile below Corbett's ranchhouse Smith & Jones are building a quartz mill. The vein they are working is near at hand. A great deal of pocket mining is being done in the country lying between Bear Mountain ridge and Hornitos. This part of the foothill country has been successfully searched for pockets for many years.

MODOC COUNTY.

Mining development has put new life into Cedarville and Fort Bidwell. Cedarville is building a $3,000 town-hall, the Surprise Valley bank is breaking ground for a $10,000 block, and a power company is constructing a line to Pine Creek, a distance of 17 miles. At Fort Bidwell a large hotel, a restaurant, and other buildings are in course of construction, and the town will soon be equipped with electric light. John Patterson is figuring on establishing automobile service in the valley. The prospects recently opened in the neighborhood of Fort Bidwell promise to develop some paying mines. The district has been retarded in its development by its isolation from the outside world, and by the expense of transportation.

NEVADA COUNTY.

The Olympus Mining Co. has been incorporated by Cyrus Bradley and F. L. Kershaw, of Spokane, and H. Reiter, of Grass Valley. They own and will work property in this county.

PLACER COUNTY.

The Home Ticket gravel mine at Last Chance is working from 15 to 20 men and is said to pay $8 to the man. Frank Tillotson is superintendent. The mine is owned by Alfred Dixon and others. There are two other mines in the Last Chance district which are good claims—the El Dorado, owned by D. M. Ray, with Millard Hyland as superintendent, and the Startown, with Will Davis as superintendent. The Blueyes is also being worked.——The Three Stars, west of Auburn, has been running during the past month on some of the best ore ever seen in the mine.——It is reported that the tributers have ceased work on the Turkey Hill, near Michigan Bluff.——As soon as the snow melts, there will be much prospecting done in the Canada Hill district.——The Barton mine, near Westville, is to be re-opened.

RIVERSIDE COUNTY.

The Good Hope mine, near Perris, has been sold by Hook Bros. to the newly organized Shaftrock Mining Co., which proposes to re-open and equip the property on a modern basis. The Good Hope has produced many thousands of dollars under adverse conditions, and with inadequate milling facilities.

SACRAMENTO COUNTY.

(Special Correspondence).—Keefe & McDermott at the Spring Hill gravel mine are working five or six men owing to scarcity of water.——At the Blue Ravine drift mine, under the management of A. C. Kern, the force of 40 men will be increased. The men are working eight-hour shifts, underground on contract. The mine is well equipped and promises to be a steady producer.——The Folsom Development Co., R. G. Hanford, manager, is operating five dredges. The men work eight-hour shifts, three men to a shift. The dredges run continuously, day and night. About 125 men are employed, the greater part of whom are working on repairs. The plant is equipped with a first-class, modern machine-shop. The entire plant is up to date in every detail.

Folsom, July 16.

TRINITY COUNTY.

The Fairview mine, near Weaverville, which has been closed down since last spring, is to be re-opened. Chas. Doebler is superintendent.——The owners of the Bonanza King mine, ten miles from Trinity Center, find difficulty in equipping it with a 20-stamp mill. The altitude is 7,000 ft. and the mine is reached by a trail. A wagon-road five miles long is nearly finished at a cost of $25,000, there being 200 men employed on the road, at the sawmill, on mill-construction, and in building an electric power plant with a capacity of 600 h.p. There is a large body of ore on the claim.

COLORADO.

GILPIN COUNTY.

W. C. Cutler, of the Mountain Monarch Mining Co., has put men at work on the Chieftain and Seth Thomas veins, in Gambell gulch. The main adit is 700 ft. The company—in which Centerville, Iowa, people are largely interested—intends to put new concentrating tables in its mill.——The Copper Jim group is situated in South Boulder canyon, above Boulder Park, and is operated by the Copper Jim Mining Co. under the management of James A. McCracken. This company has started an adit and will prospect the property. A new cabin and blacksmith-shop are to be built at the adit.——James A. Gilmour, of Central City, will resume operations on his Daisy Extension group on Perigo hill, consisting of five patented and one unpatented claim. The main shaft is down 130 ft. and the owner intends sinking it to the level of the Perigo adit which will give 400 ft. more depth and drain the property. Drifts will also be run at a depth of 130 ft. east of the shaft. It is the intention of Mr. Gilmour to remove the Daisy mill from Gambell gulch to a site near the mine, to save the cost of hauling ore and with the shaft down to the adit-level of the Perigo property there would be plenty of water to use for milling purposes. There is a first-class plant and a good building on this property.——The Wire-Gold Mining & Milling Co. has resumed sinking on its new shaft up Black canyon, its present depth being 35 ft. Free gold has been taken out of the surface workings and the company (mostly Nebraskans) will develop the property for shipping.——Work has been resumed on the Gold Dollar group on the south side of South Boulder creek by Central City owners. Development is by adit, which is in 400 ft.——Three shifts are at work at the Black Hills and Denver main adit in Boulder Park, and Superintendent Van Fleet reports that they are making eight feet per day. A three-foot vein has been opened up; it carries $10 per ton gold, silver and copper.——A compressor has been delivered to the Golden Sun adit and the new 100-h.p. boiler has been installed and the foundation for the

compressor is nearly finished. The main adit is in 550 ft. and the company intends to open up all of its property through it, as well as to extend it on the Perigo and Tip Top mountain to cut the Perigo, Gold Dirt, Mountain Chief and other veins which have been big producers. E. T. Butler is in charge of the operations.——Two cars of tailing from the Perigo mill were shipped to the Argo smelter from Rollinsville depot last week.——A number of the mines in the North Beaver creek section are taking out tungsten ore and several shipments are being taken out for Denver buyers.

IDAHO.

CUSTER COUNTY.

W. H. Plummer, of Spokane, has purchased for $100,000 a group of 27 claims in the Big Copper basin, for a syndicate of New York and Boston men. The claims are crossed by two well-defined veins, from which 61 assays have given an average of $33 per ton copper, with a little gold and silver.

MONTANA.

FLATHEAD COUNTY.

E. M. Heyborn, George H. Walters and C. W. Moegling, of Spokane, have acquired the property of the Shaughnessy Lead & Silver Mining Co., near Libby. A new company, a close corporation, has been formed and will work the property, for which $24,500 was paid.

NEVADA.

Hot weather is retarding operations in the Nevada camps. In some of these, surface operations have had to be practically discontinued, men being unable to work in the open. Where operations are carried on underground, as in the more developed mines of Goldfield and Bullfrog, work is proceeding without material interruption; but at Fairview and several of the newer camps it is difficult to continue work on or near the surface. Construction work on the railroads is also being retarded somewhat; and it is reported that on the so-called Borax Smith line, being built to Bullfrog northward from Ludlow on the Santa Fe, in California, large numbers of men deserted, being unable to endure the stifling heat. In spite of this handicap Goldfield, and Bullfrog in particular, are advancing steadily, an unusual number of strikes having recently been reported in the first-named camp.

DOUGLAS COUNTY.

The Kennedy & Pitt mine, at Buckskin, has been closed down, owing to the increase in wages established by the miners who recently organized a local branch of the Western Federation of Miners. From $4 the scale has been increased to $4.50 and $5 for contract work. The camp has always had a $4 scale, but no distinction was made between various grades of labor. When the scale went into effect the Kennedy & Pitt mine was closed. Several other operators complained, but they are proceeding with development.

LINCOLN COUNTY.

(Special Correspondence).—On the heels of Charles M. Schwab's man, McKnight, who secured more than one good mine and a number of promising prospects for his principal, have come J. T. Wisner, of New York, H. B. Adsit, of Denver, A. T. Jergins, H. H. McCord, H. Shannon and J. Donnan Reaves, of Los Angeles, who were surprised to find so many others on the ground before them inspecting properties and making deals. There is no indication of a dull season in Searchlight this year. Mr. Wisner is inspecting the Philadelphia group of five claims in the Nob Hill district, and the Searchlight Treasurer-Gold, which are two of the properties in which his firm is interested. He is accompanied by F. F. Corliss and E. F. Flanagan, of Massachusetts, who are also interested in Searchlight properties. The shaft being sunk on the Treasurer-Gold has encountered a lode six feet wide, samples from which assay from $4 to $146 per ton. An 8-h.p. hoist has been used to attain the present depth of 100 ft. and it is stated that a larger one has been ordered. Improved facilities for preparing the ore of the Duplex mine for shipment to the Needles smelter have been completed. The present output amounting to about a carload per week will be increased when better transportation is available by the completio nof the Barnwell & Searchlight railroad. An order for 24 miles of 50-lb. steel rail has been placed for the Searchlight railroad. Prospecting on the Sunny Jim group of three claims this week disclosed a 30-ft. vein of porphyry and quartz with a four-foot streak averaging $8 per ton. The Colorado Mining & Milling Co., represented here by its vice-president and manager, H. B. Adsit, has purchased a 25-h.p. gasoline engine and a 50-h.p. hoist and commenced sinking a 200-foot double-compartment shaft, 5½ by 11½ ft. in the clear, on the New Year claim. The company has also ordered a pump of 120-gal. per min. capacity, and it is expected that the new equipment will be on the ground about September 1, when the 200-ft. shaft will probably be completed.——The Cyrus Noble Extension, having reached the 100-ft. level, will now open a level by cross-cutting and driving on the vein.——The Searchlight Electric Light plant is nearing completion. Ore reported to run about 40 % lead and 30 oz. silver has been struck on the Annette property. The lead ore is galena.——In El Dorado Canyon district it is reported that the management of the Mocking Bird group has ordered machinery to develop at greater depth a vein rich in gold. A gasoline engine has been ordered for the El Dorado; also a blower. The shaft is now 150 ft. deep and the present equipment is inadequate for further sinking.

Searchlight, July 14.

NYE COUNTY.

(Special Correspondence).—The warm weather seems to have stimulated mining operations in the Manhattan district, for development is being carried on with more vigor than ever and some new strikes have been reported. Several workings are now nearing the 200-ft. level, in ore of better grade than found near the surface. The double-compartment shaft on the Manhattan Con. is down 125-ft.' and with the large pump to handle the water there will be no trouble in carrying on the work to greater depth. This property has the distinction of having the first high-grade ore in the camp. The trend of the orebody of the Manhattan Con. is toward the property of the Manhattan Mother Lode Mining Co., to the southeast, and that company is prospecting for the shoot by means of an adit. The Consolidated Extension, to the northwest of the Consolidated, has the orebody in its adit, and is now blocking out the ore. A mill will be erected on the Extension property.——The shafts on the Union No. 9 claim, of the Manhattan-Dexter and the Little Gray, are now down nearly 200 ft., both on the same vein of milling ore, with occasional streaks of high-grade ore, which is being shipped. Contracts have been closed for a 25-stamp mill, which will be erected at Central, two miles west of Manhattan. The site of this new mill is advantageous for the Manhattan Nevada Gold Mines Co., which is driving an adit on the Georgey group at Central. Ore has been opened up at the various places on this property.——The lessees on the Pay Ore claim of the Paymaster Mining Co. are sacking ore. Some specimen stuff has been taken from the Sullivan lease on the Pay Ore claim.——The Sentinel claim, which, it is understood, will be taken into the Manhattan Combination Co., still attracts attention. The ore piled on the dump will be shipped to the smelters at Salt Lake City.——The shaft on the Mustang is down 175 ft. and several veins of milling ore have been cut. It is the intention to sink and cross-cut to the various veins. A force is at work on the Broncho Mining Co.'s property adjoining the Mustang, between that property and the Manhattan Express, which is also the scene of activity. A large vein, which can be traced through the Mustang, Broncho and Express, has been opened up on the Buyo claim of the Mustang Co. This is an entirely new vein, and much activity is being shown in its rapid development.——Word comes from the Buffalo Mining Co. at East Manhattan that a mill will soon be in operation at that point. The Manhattan Mammoth is in good ore at 240 ft. in its adit, and the Consolidated Manhattan is in good milling ore at 166 feet.

Manhattan, July 14.

Two prospectors, Clark and Johnson, are lost in Death Valley and are thought to have perished not far from Emigrant Springs. They were last seen July 8. Searching parties are looking for the missing men. The prospectors started from their camp near Emigrant Springs, carrying only one canteen of water, to go to their prospect a short

distance away. They have not been seen since. It is supposed that they lost their bearings and were overcome by the heat.

WYOMING.

BIG HORN COUNTY.

The 150 laborers on the Corbett tunnel of the Government irrigation dam at Cody who struck a few days ago and took possession of the camp and defied the authorities, were promptly shipped East. Company E, Wyoming National Guard, and a deputy sheriff with 30 deputies, swooped down upon the camp of rioters, who surrendered without firing a shot. They were paid off by the reclamation officer, marched to Cody and placed aboard a train. The State troops patrolled the town all night and until the rioters left. The 500 workmen who had been intimidated by the strikers returned to work the following morning.

MEXICO.

GUANAJUATO.

In a recent interview in Mexico City concerning the Guanajuato mining district, Dwight Furness said:

A year ago I predicted that the monthly output from the Guanajuato mining district would be $1,000,000, and from present indications I believe my prediction will come true before the end of the year. An average of $250,000 per month is being expended now in Guanajuato in adding new machinery and developing the mines. The work there is past the bonanza stage and the owners are not looking for rich strikes. They have settled down to working the mines on a sound business basis, and as a result are extracting valuable ore. The Guanajuato Reduction & Mines Co. is working the dumps and its success in this direction is even better than predicted. The company will begin soon to work the mines, and will have even better success. The most promising mine at present is the Pinguico, which has shown up wonderfully rich. As soon as arrangements for handling the ore, shipping, etc., are arranged, it will be yielding $100,000 per month. The thing most needed at present, however, is a railroad. We have completed plans and have them before the Government now for approval for a line from Salamanca to Guanajuato. This line will connect with the National lines at Salamanca, and when completed will greatly help Guanajuato. Capital in the United States is being interested in this line and we expect to begin work at the close of the rainy season. As most of the route is favorable the road will be completed in a year. The Central also is planning the extension of the line from Marfil. This need of a railroad is what is holding back the development of the mines at present. The yards at Marfil are now filled with cars of mining machinery which cannot be handled fast enough with the present limited railroad facilities. In addition hundreds of cars are held at Silao until those at Marfil are gotten out of the way. Carloads of machinery are being shipped into Guanajuato as fast as possible, but the work will be retarded until our new line is constructed. With conditions as they are at present, however, the future of Guanajuato looks very favorable indeed. The entire district is in a prosperous condition.

SONORA.

The 50-stamp mill of the Llanos de Oro Co. was started last week. The Llanos de Oro is a placer property in which the gold is found at depth in the old bed of a river which has since changed its course. The formation is strictly placer, though it has been reached by means of shafts and drifts. The dirt hoisted is cemented and requires crushing to liberate the gold. The initial tests gave good results. It is understood that if the stamp-mill proves satisfactory, it will be doubled. The San Juan Bautista Mining Co. in the Moctezuma mining district has made a 20-ton sample run at the Cumpas smelter on ore which netted a little over $3,000. The ore was not sorted.

AFRICA.

TRANSVAAL.

For some time past several prominent mining men in Johannesburg have been acquiring ground between the Black Reef and the Klipriversberg series, and it is reported that an important discovery has been made, and that a new reef has been traced from Zuurbekom, adjoining Gemsbokfontein of the Western Rand Estates on the west, to Rooikop on the east, where the Orion mine is situated, to Finaalspan. A reef has been opened up underlying the Black Reef series and a certain amount of exploration has been done on this body with good results. A shaft has been sunk to a depth of 170 ft. and assays at this depth are encouraging. The horizon of this new discovery is placed between the Black Reef and the beds of the Steyn Estate series, and it is contended that the discovery throws an interesting light on the strikes made by the Western Rand Estates on Gemsbokfontein and adjoining properties. In addition to the discovery mentioned, there has been a good deal of locating recently in the vicinity of the Van Ryn mine. Licenses have been taken out for no less than 1,500 claims. While it does not seem likely that the Van Ryn people would allow any reef close to their mine to remain unprotected, it is only recently that a new discovery was made in the underground workings of the company, and a considerable tonnage of ore unknown to exist a few months ago has been added to the mine.

CANADA.

BRITISH COLUMBIA.

The Tyee Copper Co., Ltd., of Duncans Station, Vancouver Island, reports smelter returns for June as follows: Smelter ran 15 days and treated 3,123 tons of Tyee ore, giving a return, after a deduction of freight and refining charges, of $36,630.

(Special Correspondence).—Adrian G. Hanauer, of Spokane, has received word that the aerial tramway, the sawmill and the pipe-line are practically completed on the property of the Bear Hydraulic Mining Co. at Bakerville, B. C., in Cariboo district. Seventeen Chinamen and five white men are employed. The company owns 6,780 ft. along both sides of the channels of Cunningham and Pass creeks. The pay-gravel is 400 ft. deep. This holding of the company is said to comprise the largest area of unworked gold-bearing gravel in Cariboo district. B. Laseke and Joseph Wendelle are in charge of the work.——The Five Metals Mining Co. will build a smelter on the company's property, seven miles from the Five Metals landing on Kootenay lake. The property is owned chiefly by Spokane people.——George Turner says the Sullivan mine, 20 miles north of Cranbrooke, will soon pay off the remaining $20,000 of the $125,000 advanced to the company by Charles Sweeney. He says that the company is smelting 100 tons of ore per day.——A. B. Campbell, of Spokane, has taken a bond on a group of quartz claims in Alaska, and has sent experts to examine the property. The claims are on Falls creek, a stream 22 miles from the Seward, Alaska & Central Railway.

Spokane, July 14.

The ore output of the mines of the Boundary for the month of June, 1906, was 102,589 tons. The ore output and smelter treatment of the Boundary mines for the week ending July 14 was as follows: To Granby smelter from Granby mines, 15,640 tons; from Emma, 99 tons; to British Columbia Copper Co.'s smelter from Mother Lode, 1,024 tons; to Dominion Copper Co.'s smelter from Brooklyn-Stemwinder, 3,531 tons; from Rawhide, 330 tons; from Sunset, 825 tons; from Mountain Rose, 40 tons; to Nelson smelter from Emma, 77 tons. Total shipments for the week, 21,566 tons. Total for the year to date, 661,889 tons. Boundary smelters treated this week: Granby smelter, 16,350 tons; Dominion Copper Co.'s smelter, 4,726 tons. Total for week, 21,076 tons. Total for year to date, 667,249 tons.——A strike of rich ore is reported on the Strathmore mine, at Greenwood, at the 100-ft. level. James Donohue, of Chicago, who is interested in the property, says electrical machinery has been ordered. ——A. J. McMillan, managing director of Le Roi mine at Rossland, reports that the mine shaft is to be deepened from the 300 to the 1,700-ft. level. Explorations have proceeded by means of a winze from the 1,300 to the 1,700-ft. level. As some large shoots of ore of a high grade were found below the 1,300-ft. level it has been decided to sink the shaft. It is a five-compartment shaft and the extension of it down to the 1,700-ft. level will cost a large sum.——Following are the shipments for the week: Centre Star, 2,076 tons; Le Roi, 2,820; Le Roi No. 2, 570 tons. Total for the week, 5,466 tons, and for the year, 172,831 tons. The reports of ore at the Trail smelter for the week were 5,681 tons.

Personals.

HENNEN JENNINGS is expected in San Francisco.

CHESTER W. PURINGTON has returned to Denver from Boston.

L. D. RICKETTS has returned to Bisbee from a trip abroad.

R. H. GOODWIN has returned to England from British Guiana.

C. W. GEDDES and C. W. ABBOTT are at Urique, Chihuahua.

JOHN W. HUGHES has returned to Fairbanks, Alaska, from Los Angeles.

GEORGE KISLINGBURY, of Los Angeles, is examining mines in New Mexico.

W. P. MARTIN is mine foreman at the Gold Flat mine, near Grass Valley, Cal.

EMIL HUERTER is metallurgist for the new Central Zinc Company, in England.

LOUIS D. RICKETTS has returned to Globe, Arizona, from a flying trip to Europe.

JOHN ROSS, JR., has returned to Sutter Creek, Cal., from a trip to mines in Oregon.

JAS. W. ABBOTT is visiting San Francisco, on his way from Denver to Los Angeles.

CHAS. A. SHORT of Goldsprings, Utah, is manager for the Jenny Gold Mining Company.

E. B. QUIGLEY is superintendent of the Barton mine, near Michigan Bluff, California.

GEORGE A. BAIRD, of Sharon, Pa., president of the Western Exploration Co., is at Salt Lake.

A. R. MILES is superintendent for the Blue Flag Gold Mining Co. at Breckenridge, Colorado.

W. H. PAUL, of Denver, is now in charge of mines in Las Plomosas district, Chihuahua, Mexico.

W. M. TURNER is now foreman of the Green Mountain Consolidated mill, at Silverton, Colorado.

MICHAEL F. BURKE and some Boston friends are inspecting mines at Breckenridge, Colorado.

D. A. CONNOLLY, on his return from Mexico, has opened an office at 318 Laughlin Bdg., Los Angeles.

H. M. RIDGE has been appointed general manager for the Central Zinc Company, on the Tees, England.

CORY C. BRAYTON has been appointed manager of the Dairy Farm mine, in Butte county, California.

W. F. COLLINS is manager of the Holy Terror-Egyptian Consolidated mines, at Keystone, South Dakota.

O. N. BROWN, of Deadwood, is general manager of the Iowa Mining Co., at Central City, South Dakota.

L. MAURICE COCKERELL has resigned as manager of the Mesquital Gold Mines, Ltd., in Zacatecas, Mexico.

T. H. MERRITT is manager of the Comanche Mining & Smelting Company, near Silver City, New Mexico.

HARRY MCCREARY, formerly of Indiana, Pa., and now exploring in Nevada, visited San Francisco this week.

B. A. LANGRIDGE, of Boulder, has been appointed State Geologist of Colorado, in succession to JOHN W. FINCH.

J. D. SHILLING, of Michigan, has been appointed general manager of the mines of the Utah Copper Co., at Bingham.

GEORGE M. STOCKINGS has been appointed manager to the Carolina Development Syndicate, in the eastern Transvaal.

STANLEY N. GRAHAM, formerly of Guanajuato, has been appointed superintendent of El Favor mines, in Jalisco, Mexico.

CHARLES S. PALMER has resigned as associate editor of *The Engineering and Mining Journal*. He is on a holiday trip in Maine.

DUNCAN MACVICHIE is now managing director of the Bingham Consolidated Copper Co. and H. L. CHARLES is general manager.

P. J. DONAHUE, of Salt Lake City, is consulting engineer for the Standard Copper Co., recently organized to operate at Bingham, Utah.

JOHN PETERSON, formerly of the Winona mine, is now in charge of underground work for the Hancock Consolidated Co., at Hancock, Michigan.

JOHN V. BOHN, lately at Butte, has been appointed superintendent of the Green Mountain & Lone Pine mines, in Mariposa county, California.

CHAS. W. CLAWSON, superintendent of the Copper Queen mines, has returned to Bisbee from an inspection of copper mining methods in the Lake Superior region.

A. A. COLE, lately with the War Eagle and Centre Star mines, at Rossland B. C., has been appointed a mining engineer to the Temiskaming & Northern Ontario Railway Commission.

Obituary.

ALBERT BEIT died in London on July 16. He was associated with Cecil Rhodes in the development of South Africa, and became one of the wealthiest men in Europe through successful operations in connection with the De Beers diamond mines at Kimberley and the gold mines of the Rand. He was a German Jew, born at Hamburg in 1853. A man of large ideas, personal generosity and kind disposition, he was much respected in the financial world of London and Berlin. His immense holdings in South Africa will be administered by the firm of Wernher, Beit & Co., of which Sir Julius Wernher is the senior and surviving partner.

STANLEY H. PEARCE died at Magdalena, in Sonora, Mexico, on July 10. He had been ill but a short time, the cause being erysipelas. He leaves a wife and two children. Stanley Pearce was one of the four sons of Richard Pearce, of Denver, and his sudden death will be keenly felt among a large circle of friends. He was only about 38 years old. A graduate from the Sheffield Scientific School of Yale University, he obtained his first experience at Butte, where he was employed by the Colorado Mining & Smelting Co., under Chas. W. Goodale. During the Klondike excitement, he equipped an expedition and went to the Yukon. Supsequently he engaged in copper mining at Magdalena, near Nogales.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

New York, Boston and London, July 18.

Anaconda	$32 5¼	Ontario	$ 2½
Bingham	26½	Standard	2¼
Calumet & Hecla	680	Trinity	7⅞
Copper Range	69¾	U. S. Mining	54
Daly West	15	Utah Copper	53⅝
Granby	10¼	Wolverine	136
Greene Con.	2⅛	De Beers	£17⅛
North Butte	85	Rand Mines	£ 6¾

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 12. £ s. d.	July 19. £ s. d.
Camp Bird	1 4 6	1 4 3
El Oro	1 5 7½	1 5 6
Esperanza	3 18 1½	3 16 3
Dolores	2 0 0	2 0 0
Oroville Dredging	0 17 6	0 17 0
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 5 7½	1 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending July 12.	Average Prices for Week Ending July 19.
Lake	$18.50@18.70	$18.50@18.62
Electrolytic	18.05@18.30	18.00@18.25
Casting	17.87@18.00	17.85@18.00
Lead	5.75	5.75
Spelter	5.97@6.00	6.00
Silver	0.65⅛	0.65⅜

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

THE first hoisting by steam on the Comstock Lode was done in the Ophir incline by wrapping a rope attached to a bucket around the shaft of the pumping engine.

THE WHEELER PAN was first patented December 8, 1863. The Varney pan, with its mechanical stirrers, was decided by the court to be an infringement on Wheeler's patent.

THE value of the mill gold produced by amalgamation on the Rand is about $18.40 per oz. That of the Homestake about $17. Placer gold is always finer than mill gold from the same original sources.

'FLOURING' of mercury is the minute subdivision of it by mechanical causes and 'sickening' is the rendering of such a condition permanent by the intervention of a coating of foreign substance, which prevents the coalescing of the globules.

THE fewer the appliances required to extract the metal out of the ore the better; a marksman is not considered a good shot who misses with his first barrel. Don't overlook the vanners because you have got a canvas plant for your tailing.

WHERE a mine produces some high-grade ore which occurs so disseminated as to make sorting necessary, it is good business to put in rolls, trommels, and jigs, producing a concentrate that can be shipped, the silicious gangue being milled at the mine.

THE average red clay brick has a modulus of rupture of 500 lb. per sq. in., and crushing resistance up to 5,000 lb. per sq. in. The best bricks exceed these figures about 20%. Pale red bricks are not usually so strong as those of full red color.

LINARITE is a basic sulphate of lead and copper, occurring in deep-blue crystals. It may be easily distinguished from azurite (blue copper carbonate) by the ready effervescence of the azurite in nitric acid. Linarite does not effervesce in acids.

GRAPHITE has been successfully employed as a lubricant in gasoline engine cylinders, and it may possibly be suitable for compressors, though we have no data on the latter. The graphite could be fed to the cylinder through the valves on the intake stroke.

ANY form of protection from lightning in electric wiring is without value unless the ground connection is carefully made. It is not sufficient to connect the ground leads to a rail or even to a pipe driven into earth, but a reliable ground connection must be secured.

'METALLICS' is the term applied to those bits of ductile metal (usually native gold, silver, or one of the malleable sulphides), which do not pass through the sieve of the assayer in that process of final pulverization which the pulp undergoes before being weighed for the crucible.

A WEST AUSTRALIAN authority describes 'strike' and 'lock-out' as follows: "A strike may be defined as a refusal by the workers to continue to work for their employer unless he will give them more wages or better conditions of labor. A lock-out is the converse of a strike. It is the refusal of an employer to allow his workmen to work unless they will accept his rate of wages, or the conditions of labor he imposes. In neither case is the employment finally determined, the intention of the workmen in the one case, and the employer in the other, being that the employment shall be continued if a satisfactory settlement of the matter in dispute can be arrived at."

THE first stamp-milling in the United States was done in Georgia, but the modern stamp-mill had its origin in California. The Georgia methods of milling were based on the older practice of Hungary. Hungary borrowed from Egypt.

SANDSTONE occasionally carries gold, but where this is the case the probability is that the gold is fragmental and was deposited contemporaneously with the material now forming the sandstone. Rarely it is due to subsequent infiltration along cracks.

MERCURY solidifies at —40 degrees C., and boils at 360 degrees C. It emits vapor at 15 degrees C., and perhaps at even lower temperatures. It is the worst conductor of heat of all the metals, its conductivity being only 5.33, that of silver being taken at 100.

TESTS have been made recently on the corrosion of boiler-tubes by forcing air through tubes made wet with distilled water. In 16 weeks the loss in weight was 0.315 gram per square inch. When the water was made alkaline, the loss in the same time was reduced to only 0.0997 gram. It appears that if the water in a boiler is made slightly alkaline the corrosion of tubes may be materially reduced.

CAVING of ground in mines is usually accompanied by concussion of the air, which is destructive in its effects in proportion to the magnitude of the cave. A cave in the Imperial mine, on the Comstock, occurring in March, 1863, caused rocks to be blown up the shaft more than 300 ft., the fragments striking the roof of the hoist-building which covered the shaft. This was due wholly to the rapid expulsion of air from the workings by the collapse of ground. Broken rock occupies about 50% more space than when in place; and the sudden caving of a large mass thus displaces a great volume of air.

TURQUOISE occurs in eruptive rocks, usually trachyte or rhyolite. It is a hydrous phosphate of aluminum, colored by copper salts. Its hardness is 6—a little less than that of quartz—which serves to distinguish it from chrysocolla, the copper silicate, the hardness of which varies from two to four. It is soluble in hydrochloric acid; on addition of ammonia there is a pronounced blue coloration, due to the presence of copper. Natural turquoise is often treated to give it the desired blue color. Some varieties possessing a fine color when first excavated, fade on exposure to pale greenish-blue, but turquoise of this sort is not in demand. The mineral occurs in small irregular bunches and in veinlets in the lava, which usually is brecciated.

IT would be dangerous to attempt to operate a hoisting engine in lowering a bucket, skip, or cage, depending wholly on the air compressed in the engine-cylinder by the reciprocal movement of the piston to act as a brake without any other means of control. Engines are made having auxiliary cylinders set tandem with the engine-cylinders and connected with the air-receiver of a compressor, but this style of brake arrangement has not become popular as yet. The best type of hoisting-engine control is the post-brake, though many believe the band-brake and the end-friction brake are equally safe. Some large hoisting-engines have steam-brakes which are usually set unless the steam is shut off. These brakes operate automatically.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Mining Method Wanted.

The Editor:

Sir—I have read with interest the problem submitted by 'New Superintendent' in your issue of May 19, namely, "The cheapest and best method of extracting all the ore from a 50-ft. ledge, with a dip of 23 degrees." I cannot understand how so flat a ledge could be worked by the draw-stope system. I agree with the 'Prospector' in sinking a shaft from the surface and connecting it with the tunnel already driven below. I herewith submit my solution to the problem.

Sink an incline shaft from the surface in the foot-wall and about 30 ft. under the orebody, connecting it with the tunnel-level. While sinking the shaft, commence taking out the ore on the tunnel-level, on one or both sides of the cross-cut, from foot to hanging wall, carrying the breast of ore about 12 ft. high. As fast as the muckers clean out the broken rock, the whole space from hanging to foot-wall should be timbered with square sets, having 8-ft. posts. Cover the sets with 6-in. poles or 4 by 12-in. planks. Run the car-track on the foot-wall side of the stope, with turntables every 20 ft. for the tracks that go to the chutes on the hanging-wall side of the stope. Chutes should be put in every 20 ft., three in line from hanging to foot-wall. When the timbering is completed commence stoping on top of the sets, at each end of the stope, taking a stope about 10 ft. high from wall to wall; the machine-men will stand on the broken rock. When sufficient rock is broken so that shovelers will not interfere with the machine, commence shoveling rock into chutes. When about 50 ft. of stope is cleared of broken rock, filling should be introduced. First line chutes and manways with 10-in. cribbing or shaft-sets. The chutes, not less than four feet in the clear, should be carried up to about five feet from the back of stope and at an angle of 40° toward the foot-wall. Start cross-cuts in hanging and foot-wall to get waste for filling, the waste being conveyed in wheel-barrows to stope. As the work progresses, other cross-cuts should be started at convenient places. The entire orebody can be mined at one operation, or in sections. When the shaft is connected with the tunnel-level and stations cut every 100 ft., start a cross-cut at the first station above the tunnel-level and cut the orebody through to the hanging wall. Connect with the stope below by a raise, for ventilation, and also for letting down cribbing and waste. Run a drift from every station, parallel to the orebody in the foot-wall, and connect by a raise with the orebody, in order to form chutes for the upper foot-wall section of stopes, using the waste for filling the stopes below. When the stope reaches the height of 100 ft. or the cross-cut, timber on top of filling for another level. Pockets should be cut under each station and ore conveyed to the surface or down to the tunnel-level, as desired. The entire orebody can be worked in this manner at a small cost, the writer having had experience in mines where $2.50 per ton ore was made to pay when worked by this system.

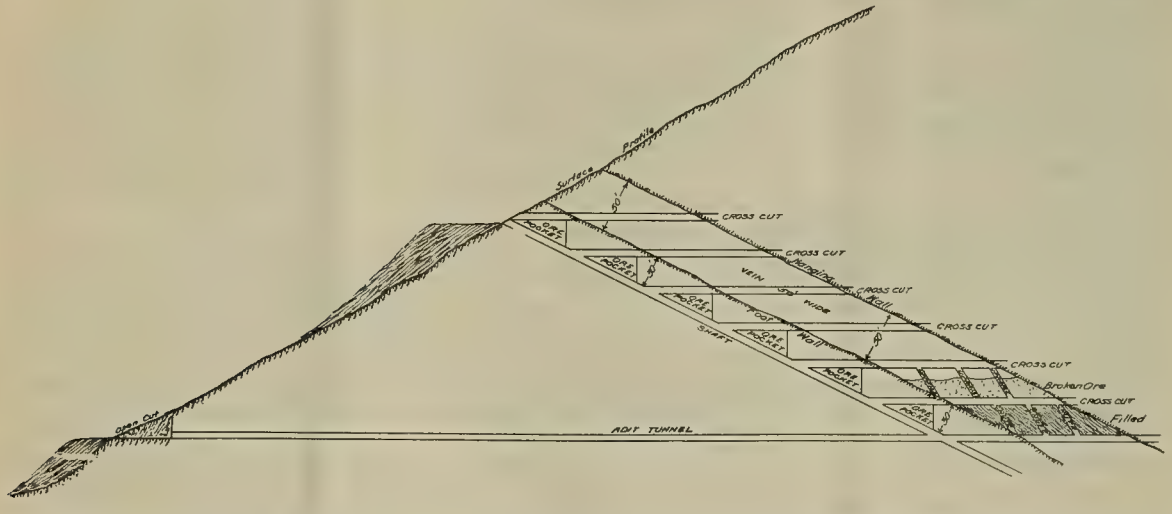
R. H. SUTTON.

Enterprise, Cal., June 30, 1906.

Elevator Machinery.

The Editor:

Sir—We are in receipt of a letter from Mr. F. Lynwood Garrison of Philadelphia concerning one of our elevators used at Carthage, Mo., in what is termed the Yellow Dog mine. This letter is in response to our letter forwarded



to him through you. Your paper was one of the first to speak of this system of elevating ores, and in an editorial on December 23, 1905, you spoke particularly about this system. The writer fully believes that where there is an incline to the shaft, ore can be successfully handled much cheaper by using a continuous-elevator system than by any other method. A continual flow of material is much better than by any other method if it can be practically done.

The operation of our elevator is as follows: The ore is dumped from regulation cars into a receiving separator at the bottom, and is automatically fed into the elevator and elevated to the top, a distance of 300 ft., at a cost of 1.8c. per ton. In estimating this total cost we have figured on a depreciation of 20% in machinery, and the usual depreciation is figured at only 10% in roller-chain, and this drop-forged chain is much more durable than roller-chain. Therefore we believe that we have been liberal in allowing the depreciation. We have also figured the cost of two men, one at the bottom of the elevator and one at the top. This is really not required, although we have included it in estimating the cost. We have included also the cost of fuel and interest on investment.

We do not know the exact cost of elevating ore a distance of 300 ft. at the rate of 50 tons per hour by the ordinary method. If you can give us this information direct or through your paper we should be very glad to have you do so. But our opinion is that a cost of less than 2c. per ton, including cost of motive power, is extremely low.

This cannot be considered an experiment, for the reason that the Underwriters Land Co. has just given us an order for a duplicate elevator, and the company is extremely careful and a shrewd buyer.

C. O. Bartlett.

Cleveland, July 5, 1906.

[We shall be glad to publish figures or criticisms from others on this subject.—Editor.]

Mining Method Wanted.

The Editor:

Sir—The proposition put before your readers by 'New Superintendent' is extremely interesting to practical mining men, and it is to be regretted that more information regarding approximate average value of the ore per ton is not given. Wages, it must be assumed, are about the same as paid elsewhere through the southern part of the State of California; timber, it is said, is available, though its use is undesirable on account of the low grade of the ore. It does not state, however, whether the latter is gold, copper, or lead, etc. Another important consideration that is omitted is whether the reduction works, if any, are above or below the adit level or in other words whether it is necessary to raise the ore above that level on delivery at 'pit's mouth'; presumably not. Let us then, for the sake of a clearer discussion, assume that the ore is worth say, $3 at pit's mouth and that it is not necessary to raise it above the level of the adit on reaching surface.

In my opinion the Prospector's method of *stoping* the rock is good, but the general scheme has several weak points, as follows: It may be necessary to sink the incline, or as I would suggest, *raise* from the intersection of the adit and the vein, to the surface, yet this work should be done in the vein and not below it and if the ore will produce $3 per ton as assumed, the operator would have over $5,000 in hand for future work—a weighty consideration; nor should this method be disadvantageous in any way. Instead of running the bottom of the stope into the barren foot-wall as shown in the sketch accompanying Prospector's letter, I would suggest that the triangular block of ore now left below and on the 'dip' side of the main gangways be partly removed and the space used as a small ore-pocket. The main ore-pocket would be situated near the intersection of the adit and the vein, and the ore from the small pockets on the incline could be brought here and trammed out of the adit cheaper than by hoisting through the slope which would entail a larger expense in maintenance and operation. Transporting the ore from the stopes to the main pocket could be done by a gravity-tram or by a balance system. A most important consideration is the filling of the stopes, which, if necessary, will be expensive. By the Prospector's system, for instance, which entails a series of raises and shafts at intervals and an accompanying tram service to the mill-holes (the raises), the cost must at least equal that of breaking the ore and the cost of production would probably be increased from two-thirds to double. This expense might be obviated by the use of experimental stopes which would ascertain just at what extreme stoping width the roof would stand for the requisite time, and this width could be adopted as a standard. The first two stopes, instead of being 60 ft. apart, might be started at an interval of 240 ft. and at the first sign of caving, as the ore was withdrawn at the *incline end* of the stopes, two more, 60 ft. apart, could be commenced between the first two, and 60-ft. pillars would still remain between these stopes and the first two. By the time the second series had advanced sufficiently, the first would in all probability have caved full and the third set of stopes constituted by the pillars above mentioned, might be started. In any case even were it found absolutely necessary to fill, at least 50% of the space could be left open, as the stopes, though still carried longitudinally with the vein, could be made narrower and only every alternate one filled.

In Mr. Nickerson's method of working the ground he speaks of filling the stopes with a raise and cross-cuts driven every 60 ft. as shown on his sketch. The smallest of these stopes, the triangular one ABD, would contain approximately 17,000 tons of loose rock, and as the raise and cross-cuts mentioned would produce less than 1,000 tons, a more elaborate system would be necessary; moreover it is probable that much shoveling might be necessary to remove the ore in the portion of the stopes below the crib-chute. The system of dropping all the ore directly through a main chute, however, to the adit, strongly commends itself.

D'Arcy Weatherbe.

Berkeley, July 14, 1906.

Building Stone in California.—Nearly every class of building and ornamental stone is found in California. Granite is quarried in Los Angeles, Madera, Nevada, Placer, Riverside, Sacramento, San Bernardino, San Diego, Tuolumne and Tulare counties over a range of hundreds of miles. Limestone is quarried in Amador, Calaveras, Colusa, Napa, Santa Barbara, Butte, El Dorado, Contra Costa, Los Angeles, Kern, Mono, Monterey, Placer, Riverside, San Bernardino, Inyo, Santa Cruz, Santa Clara, Shasta, Sonoma and Tuolumne counties. Marble is quarried in Amador, Riverside, San Bernardino, Inyo and Tuolumne counties. Sandstone quarries are operated in Colusa, Los Angeles, Santa Barbara, Santa Clara, Ventura and Yolo counties. Slate is largely quarried in El Dorado county. It is also found in several other counties. Serpentine occurs in a great many counties in large quantities, but has been quarried only on a small scale in a few places. It is quarried on Santa Catalina island, and as verde antique in San Bernardino county. Rubble and broken stone for macadam are quarried in a score or more counties. Porphyry is quarried for building stone at San Luis Obispo. Volcanic tufa is quarried in several places in Calaveras county, in Napa, San Luis Obispo and Sonoma counties. In this array of building stones there is a sufficiently wide range to give opportunities for the most fastidious builder. As a few striking examples of the adoption of local building materials in prominent California structures, it may be mentioned that the Post-office building at Seventh and Mission streets, San Francisco, has an exterior of Raymond granite. The three lower floors of the Fairmont hotel, on Nob Hill, are of Raymond granite. The first two stories of the W. H. Hellman building at Los Angeles are of Riverside granite. The buildings of the Stanford University are constructed of sandstone from quarries in Santa Clara county. The Kohl building, at the northeast corner of California and Montgomery streets, San Francisco, is of Colusa sandstone. The St. Francis hotel is of Colusa sandstone. The Dewey monument on Union Square is Raymond granite. Colusa sandstone is the material of which the exterior of the James L. Flood building, at the northeast corner of Market and Powell streets, is constructed.

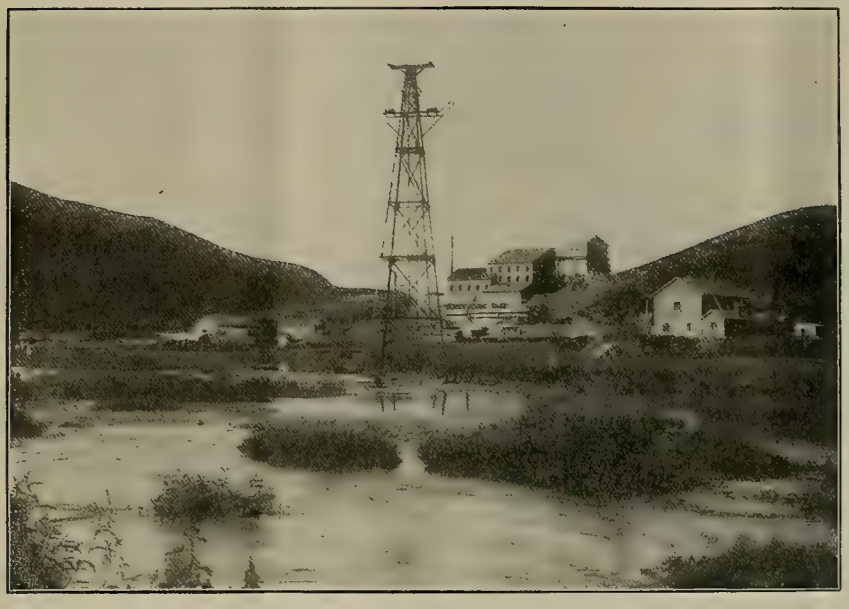
The mine-pump was the ancestor of the steam-locomotive. When coal-mining began to require unprecedented pumping appliances, attention became directed to the possibilities of steam. After the steam-pump had proved its capabilities, Trevethick and Stevenson invented a locomotive which was principally a steam-engine for pumping adapted to a new purpose and set on wheels.

Mining in Korea.

Written for the MINING AND SCIENTIFIC PRESS
By J. H. CURLE.

The Japanese, now in absolute control of Korea, are preparing mining regulations, with the idea of throwing open the country's mineral resources.

Of the known ore deposits, a number belong to the Imperial Korean Household, and it is stated that these will be worked by the Government. The foreigners in the country, who are, as a rule, distrustful of Japanese methods, believe that these Household mines will eventually be given as concessions to influential Japanese financiers; they also say that Japanese will be allowed to locate all the known orebodies, under the terms of the new mining regulations, and that the other nationalities will find that there is nothing left worth having. This may, or may not, be so. Probably their fears are exaggerated; but I may point out here that even should all the promising mines pass into the hands of Japanese, they have, as a rule, neither the practical knowledge nor the capital to handle them, and in due time will decide to sell out or hand over control to English and Americans. Should we be so foolish as to give these people what they at first ask, or to buy unproved orebodies for big amounts of cash, it will be our own fault if we lose money in Korea.



Aerial Tramway and Mill of British & Korean Mining Company.

Some years ago three foreign concessions for gold mining were given in Korea. Of these, the American has been a success; the English produced some gold, but is now worked out; and the German was a failure from the start, with no pay-ore. These concessions embraced what were presumably the best orebodies known to the Koreans. As only one concession out of three has returned the money sunk in it, the inference is that no large number of payable orebodies were known to exist in the country, and that tales of Korea's great mineral wealth must be received with caution. Personally I hold that opinion. I do not, of course, say that there are no more payable mines in the country, but I think it is correct to say that at present no payable mines are known in Korea except those in the American concession.

I heard of half a dozen quartz lodes, in different parts of the country, where there is payable ore on the surface, or to the shallow depths to which the Koreans have mined; there are also some supposedly payable placer areas, and in the northeast there are copper mines which have been worked in a primitive manner. But nearly all these belong to the Household, and should the Japanese work these entirely for the benefit of the Korean Government, it will considerably narrow the field of enterprise for outsiders. Coal is known in various localities. I imagine that mineral, at least, may be closed to foreigners, for the Japanese Government itself owns the railways in Korea, and for commercial and political reasons may wish to control the coal supply. In brief, the value of Korean mines, outside the American concessions, is entirely prospective. Gold exists in numerous spots, and to a lesser extent copper, silver, and other metals, but nothing is yet proved or assured. Even if the country is thrown open, under a liberal mining law, and the Household mines either sold or leased on a royalty basis, it will



Unloading Station and Mill with Cyanide Plant under Construction.

be some time before anything definite can be said about their value.

It is correct to say that mining conditions in Korea are excellent. The climate is healthy. In winter it is very cold, but dry; in summer there is heavy rain; spring and autumn are perfect.

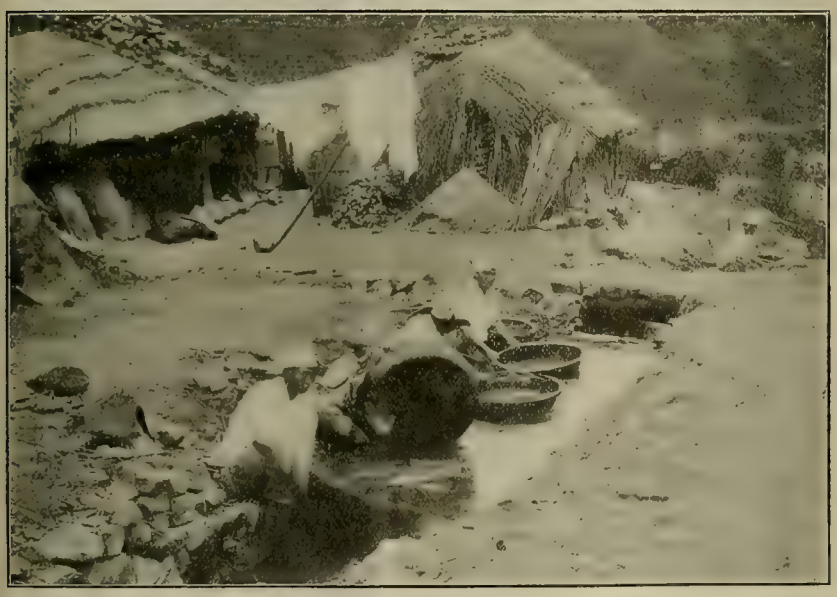
Transport facilities vary. A railway now runs from one end of the country to the other, and is conveniently situated for some of the potential mines. Numerous tidal rivers can be utilized to a considerable extent; two such have been used to advantage by the American and English concessions. The roads everywhere are bad, and for some months in the rainy season they are impassable. The local transport is by means of bulls, but as many of these animals have lately died of rinderpest, there has been more or less disorganization and scarcity. This factor, as regard supplies of fuel and timber, has at times seriously interfered with progress at the American mines. Mules, imported from the States or China, do not seem to stand the climate and many die. Generally speaking, the transport factor is an uncertain one, and a position adjacent to either the railway or a river will mean a good deal.



Fine Grinding in Korea.

The labor supply is superb. The Korean is the best colored miner I have seen, and for a wage of about 25 cents (gold) per day's work, he is but little inferior to a skilled white. In addition, he is most tractable. At times, in the plowing and harvesting seasons, there is a scarcity of labor; to obviate this it might be advisable to dump ore ahead, on the surface, so that the capacity of the mill should not be lowered. For surface work, as machinists, carpenters, blacksmiths, or engine drivers, Japanese or Chinese are used; the Korean is only in his element underground. Only a small staff of whites is required to run a Korean mine.

As to the factor of power, coal will be available for mines situated near the railway. Of wood-fuel there is a scarcity over most of Korea. The forests of the Yalu, on the northern border, would, of course, furnish all the fuel required, but the lack of transport would in many cases make the cost prohibitive. A mine located near a tidal river could draw on the Yalu with advantage. Before the purchase of any Korean mine, this scarcity of fuel must be taken into account, and the mine's relation to a permanent supply assured. At the American mines, even owning, as they do, a large tract of country, the fuel question is going to become serious. The supply of trees is limited, and the mines are 60 miles from the railway. As for water-power, this can be successfully installed in numerous localities. At the American mines an installation generating about 500 h. p. is now at work; naturally, this will do much to ease the fuel problem.



Natives Washing Gold.

As to mining timber, much the same position exists. Except on the Yalu, there is liable to be a scarcity in most localities. At the American mines soft ground and wide stopes have necessitated the use of unusually large square sets, and the timber resources of the adjacent country are, after a time, going to be severely strained. Here, again, the favorable situation of the mine will mean a good deal.

Water is, apparently, plentiful everywhere. I do not think the lack of it is a factor that need be considered.

As to the geology of Korea, very little, of course, is yet known; but there seems to be great variety in the occurrence of the orebodies. At the American mines the country is mostly granite. The principal orebody lies at a steep angle between granite walls, with, in one place at least, a width of 60 ft. of payable material. The length of the good ore is over 1,000 ft. and in the bottom, at 500 ft., there is no sign of falling off either in width or value.

Another mine on the concession is a blanket reef, about seven feet wide, lying on the granite; this is erratic in gold contents and a good deal broken, but still covers considerable area. The orebody worked on the English concession lay between limestone and quartzite; this was unusually rich for some depth, but held no pay-ore below about 400 ft. Excepting this rich patch, only low-grade ore has been found in Korea; for the average value of the American mines is less than $6, and those who have sampled the unworked Household mines, or other prospects, as a rule have got equally low results. So little is known of the lodes that one is not justified in generalizing, but it would seem that a fair proportion of the quartz veins are fairly wide, say more than seven feet, which, to some extent, counterbalances their low average value. I did not see the copper deposits which have been worked by the natives, but understand that, though of high grade in places, the width is small. For gold dredging, the physical conditions would appear to be favorable on the whole, and as gravel deposits have been worked by the natives in various localities, there is reason to think that gold may exist in these in payable quantities. Some dredging ground is now being tested at the American mines.

So much for mining conditions. It may emphasize my remarks to give some actual figures from the working of the American mines to date. The concession is the property of the Oriental Consolidated Mining Co., of New York. Work started about seven years ago. Up to July 1, 1905, 869,275 tons had been treated for a yield of $7.69 (gold) per ton. The present reserves are about a million tons, with an assay value of $5.34. About eight mines have been developed on the concession. Most of these are now worked out, or nearly so, thus showing the usual characteristics. The two largest show the most evidence of permanence. All these mines were originally found and worked by Koreans; the company should now undertake to prospect thoroughly the concession for itself.

The concession is not well situated for transport. There is a scarcity of fuel and timber; but, as against this, there is water-power sufficient for 160 stamps. Cost of operations is increased by lack of concentration of plant, for there are five mills on the property, several being 20 miles apart. There are, in all, 220 stamps. In 1905, treating 257,647 tons, costs were as follows:

Mining and development	$0.95
Tramming and milling	0.59
Treating concentrates	0.18
(Regrinding and filter-pressing are now being introduced.)	
General (including tax to Korean Government equal to about 5c. per ton)	0.44
Total	$2.16

Such figures are eloquent of the favorable mining conditions existing in this country. On a mine well situated for power and transport, with a seven-foot lode, a centralized plant and a mill of, say, 80 stamps, I venture to say that $1.70 per ton would cover all expenses. With figures such as these, low-grade ore, if in quantity, becomes valuable; but, as I have before stated, the ore has got to be found first.

THE 'verdigris,' a greenish film which forms on the surface of amalgamating copper plates, is a hydrated oxide of copper, with sometimes a little carbonate. It is soluble in dilute acids, potassic cyanide and ammonia.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

All subscribers sending rocks or minerals for determination must give full name and post-office address. Those who give initials only need expect no answer. All samples should be carefully labeled, so that they may be easily identified.

The rocks from Santa Ana, Cal., are: No. 1, Diorite; No. 2, Diorite with a few indistinct crystals of feldspar; No. 3, Quartzite stained with iron and manganese oxides; No. 4, the same as No. 3, but more dense; No. 5, Limestone (impure, due to presence of earthy minerals and organic matter).

The rock specimens from Villa Grove, Colo., are determined as follows: The two light-colored rocks are Felsite through which are scattered a few feldspar crystals and an occasional partly altered hornblende crystal, and Marcasite (iron sulphide); the dark-colored rock is Diabase, in which the dark spots are augite crystals considerably altered. The bright, glistening lath-like crystals are plagioclase feldspar.

The samples from Phœnix, Ariz., are determined as follows: No. 1, marked Silver King. The granular portion of this specimen is mostly magnetic iron ore (Magnetite). The remainder is principally Hematite; pseudomorph after pyrite; that is, the mineral was evidently originally iron sulphide, now altered by oxidation to hematite, though the crystals still retain their original form. It is feebly magnetic. No. 2, marked Liberty, is practically identical with No. 1, being Hematite, altered from pyrite crystals, which are embedded in the original quartz matrix. These ores should be assayed for gold and silver.

THE SECRETARY OF THE INTERIOR recently rendered the following decision in regard to the contiguity of a mill-site to a mining claim, in the case of the Brick Pomeroy mill-site: It is held in the provisions of Section 2337 of the Revised Statutes that, "Where non-mineral land not contiguous to the vein or lode is used or occupied by the proprietor of such vein or lode for mining or milling purposes, such non-adjacent surface ground may be embraced and included in an application for a patent for such vein or lode, and the same may be patented therewith, subject to the same preliminary requirements as to survey and notice as are applicable to veins or lodes. The words 'vein or lode' in said section are not used in the restricted sense of indicating a body of mineral or mineral-bearing rock in place only, but are used in the larger sense of designating a located vein or lode claim, and that only non-mineral land not contiguous to a vein or lode claim may be appropriated for mill-site purposes. Directions are given that all applications for mill-site patents which may be made and carried to entry before July 1, 1906, or which may, by protest or otherwise, without the fault of the applicant, be prevented from being carried to entry before that date, where the locations of the claims were made and perfected under the law in all other respects prior to January 1, 1904, shall be adjudicated, in respect to the matter of contiguity of the mill-site claims to vein or lode claims, under the practice which prevailed in the general land office prior to the departmental ruling in case of Alaska Copper Company."

THERE is no greater mistake than the hasty conclusion that opinions are worthless because they are badly argued.

Some General Principles Governing the Operation of Mines.

Written for the MINING AND SCIENTIFIC PRESS
By J. R. FINLAY.

In the many scattered observations that have appeared in the mining publications of the last three years on the economics of mining, it is often stated as self-evident that varying conditions greatly affect the cost. Mr. H. C. Hoover says* rather vigorously, "I do not want some half-baked person to rise and remind us that the varying conditions (under which mines of different countries work, or mines of the same country for that matter, or even mines on the same vein or even different parts of the same mine) may render comparisons misleading. We all know that the factors which govern working costs are labor, supplies, size of orebodies, character of the ore, volume of ore treated, depth, etc., and that these factors are never precisely the same in any two mines, nor for any two months, and that *pro forma* comparisons may give the best man a black eye and put an inefficient man on a high pedestal."

This is all true enough and yet, after all, I doubt if many of us have given sufficient attention to these varying conditions that are so lightly taken for granted. I think that with respect to each of the various metals the conditions that vary average themselves into a sort of law which is simply expressed by the prices of metals. These prices are pretty stable and bear a fairly constant proportion one to the other. In ten years copper has sold between 10 and 18c. per lb., lead between 3 and 5½c., pig iron between $10 and $20 per ton, while gold has been assumed to be stable. Probably the variation from time to time in supply and demand is much greater, and affects the price far more than the variation in the cost of production. Hence it is reasonable to state that the cost of producing each of the principal metals is, within certain common-sense limits, constant. Now since the first requisite of a mine is that it shall pay, and since the percentage of profit at the most valuable mines is rarely as much as 50% of the gross value produced, it follows that the conditions in different mines and in different countries, so far as they affect the vital question of cost, are strangely alike.

Now what is the reason the metals have different prices and that these prices have a definite relation one to the other? Precisely because the percentage of metal in an average ore varies in a fixed rule with regard to the various metals. It is just as easy to handle a ton of gold ore as it is to handle a ton of iron ore. If the gold ore contained as much gold as iron ore contains iron, either gold would be as cheap as iron or else what little were mined would yield a tremendous profit to the fortunate discoverers. We all know that neither statement is true and I run the risk of stating a childish truism merely to draw attention to the fact that gold is not dear because it is hard to find, but because when found it is tangled up with a vast mass of worthless stuff. The separation from the worthless stuff is what costs money.

The proportion of metal in an average ore of each of the metals varies inversely as the price. Stated conversely, commerce dictates that ores of different metals are worth, on the average, about the same. If copper sells at twenty times as much as pig iron we find that the ordinary copper ore carries about one-twentieth as much metal as the ordinary iron ore carries. If we assume that the standard iron ore contains 50% iron, we can assume that the average copper ore contains about 2½% copper. In the case of lead, the ordinary price seems to be about six times that of pig iron. The average lead ore as mined probably carries about 8%. The occurrence of silver and gold as by-products with this metal, introduces a frequent complication into the general proposition.

I regard it, therefore, as pretty well established that the price of metals is governed, not so much by the mere difficulty of finding them, as by the proportion they make of the rock-masses we call ore deposits. It is probably true that about as much money is spent annually to find iron as is spent to find gold; in either case the cost for finding the ore, while constituting an essential feature of the business, is not such as to have anything like a controlling effect on the price at which it must be sold.

I concede that everybody knows all this, but I think that in the literature of mining far too little attention has been paid to the logical deductions from the above facts. Let us state the case a little differently, comparing the normal ores of the leading metals, thus:

Iron ore contains 50% metal and 50% waste.
Lead ore contains 8% metal and 92% waste.
Copper ore contains 2½% metal and 97½% waste.
Gold ore contains 0.0015% metal and 99.9985% waste.

It appears at a glance that in most of the ores the proportion of waste is very high. To secure the metal, this waste must be rejected either by metallurgical or by mining process or by both. Probably too little attention is paid to the fact that a large part of this rejection may economically fall in the province of mining, and may very properly be charged as a cost of mining and not to metallurgy. When this rejection is undertaken by the mine, the cost of ore delivered over to the metallurgical process, whatever it is to be, will increase inversely in the proportion that the selected residue bears to the original mass, plus the cost of rejection. What the cost of mining should properly be in view of this proportionate rejection, is a problem that must be solved by the intelligent manager, not only for each mine, but possibly for each stope in the mine.

I have thought that mines divide themselves into three classes, as follows:

Class 1. Those deposits which by their composition and size produce ores that are ready as broken in the mine for the metallurgical process. To this class belong nearly all coal, iron and copper mines, and many gold mines, such as the Homestake and Treadwell, and even the Rand mines. The great bulk of mining operations as regards both tonnage and values falls under this class. In these mines the test of efficiency, providing, of course, for development sufficient to open the whole of the payable deposit, is the cost per ton of the ore or material raised.

Class 2. Deposits which contain a varying amount of concentrate of fixed grade. To this class belong some copper mines, such as the Baltic and Trimountain on Lake Superior, most lead mines throughout the world, typically those of southeast Missouri, also those of Joplin, Park City, and the Cœur d'Alenes. In this class the rejection of waste from ore that must be broken is often the most vital part of the mining process, hence the cost of mining the portion that finally goes to the mill may be several times the cost per ton of handling the orebody as a whole. In this class, the simplest test of efficiency is the cost per ton of all payable concentrate the deposit contains.

Class 3. Deposits containing a varying amount of concentrate of varying grade. The Cripple Creek gold mines are typical examples. Here the rejection of waste, to avoid heavy milling or smelting costs, may be carried economically to great extremes and, according to the ore, it may result in concentrates of enormously different values. It is plain that the possibility of securing a high valued product may render very expensive mining both profitable and economical. Here the only test of efficiency is the cost of extracting the payable metallic contents of the deposit.

*'Economics of Mining.' Page 34.

In the second and third classes of mines it often happens that, owing to the matter of proper checking up of the variable factors, stopes are worked at a loss. This may be the case even where the mine as a whole shows good profits; indeed, it occurs often. Examples could be given of losing mines being made to pay handsomely by simply cutting out stopes that were too low-grade. In order to eliminate the unprofitable places, those places must be detected. To do this, it is indispensable not only to keep the costs of all working places, but also to find out what each place produces. The last requirement is the one most difficult to provide. A fair idea can usually be obtained by taking a grab sample from each car of ore from each working place. The average of these will give, if not the actual value, at least the proportionate value of the ore. By checking these results against the actual value of all ore produced by the mine for a given period, a trustworthy estimate can be made of the performance of each stope.

The following scheme of cost-keeping is applicable to a mine of moderate size in the second and third classes:

JOHN DOE MINING CO.
COST SHEET FOR MONTH OF ——, 19—.

Value of Product.

Loss.

Gain.

Value of product at working place.

Tonnage.

Total value per ton.

Cost of Operating.

Assays.

Total cost.

Cost for milling, smelting, transportation, etc., per ton.

Total cost for each working place in dollars and cents.

Cost of hoisting, blacksmithing, pumping, lighting, superintendency, general expense, etc., all figured as an average for mine at so much per ton.

Detail of costs for explosives, machine drills, timbers, etc.

Detail of labor cost for each place, as desired.

STOPING.

Horizontal line, one for each working place.

Total of stopes.

DEVELOPMENT.

Horizontal line for each development heading in mine.

Total for development.

Space here for memoranda of expenses of home-office and also for actual money-returns of all ore shipped in the month.

(In practice this forms a big sheet, too large for reproduction here. This is only an illustration of the scheme).

This scheme of cost-keeping is based on the recognition of two divisions of expenditure: (1) The labor of miners, trammers, and timbermen, together with the supplies they use, forming expenses that can be charged directly and accurately to individual working places. (2) Expenses like hoisting, surface expense, superintendence, general expense, which belong to no particular stope but can be charged indiscriminately at so much per ton to the entire product. By keeping the time and issuing supplies on the above plan, the costs can be arrived at easily and, at the same time, comprehensively. In practice, the working out of the cost of the various stopes invariably shows great discrepancies. Concurrently, the values of the product from various parts of the mine will also prove to be discrepant. By combining the results one ordinarily gets information of great usefulness.

But it is not to the details of this system that I wish to draw attention, but to the general principles; that:

(1) In orebodies of the same value, the question of how the value is distributed largely controls the part to be played by mining as against metallurgy in the extraction of the metals.

(2) In mines of the first class, economy means only a low cost per ton, obtained by the handling of large masses of uniform material, lumping everything together to save expenses, keeping the output in one unit. The cost to be kept is the average of the mine worked out in great detail.

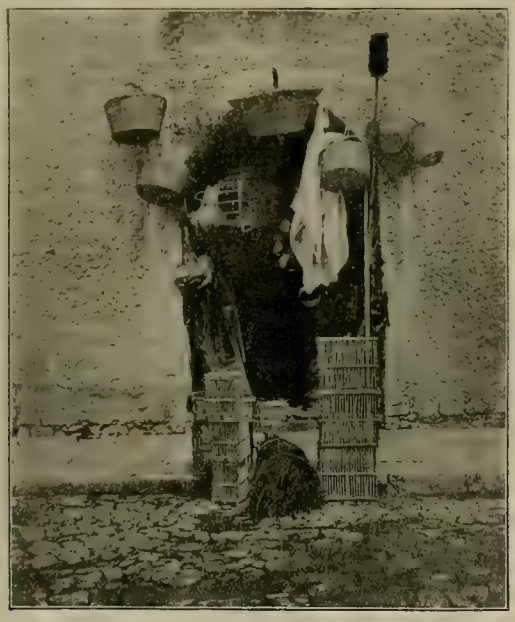
(3) In mines of the second and third classes, economy demands that ores shall be kept separate and accounted for separately. The average cost should be arrived at only as a final result from the addition of the individual stope records, and is not by any means a valuable or decisive guide to efficiency of management.

COPPER IN THE ZUNI MOUNTAINS.—According to F. C. Schrader, of the U. S. Geological Survey, the Zuni mountains form a group about 20 miles long and 50 miles wide, situated some 85 miles west of Albuquerque. They are composed of pre-Cambrian schists, gneisses and granites, and are flanked on all sides by gently upturned strata regarded as of upper Carboniferous age—the 'red beds' of the Colorado plateau region. Copperton, the principal mining camp, is situated in the heart of the mountains, 20 miles west of the Atlantic & Pacific Transcontinental railway. Copper deposits are found both in the pre-Cambrian rocks and in the lower strata of the 'red beds.' In both situations the ores thus far revealed consist almost entirely of secondary copper minerals, including green and blue carbonates and copper glance. Chalcopyrite, though present, is uncommon. In the pre-Cambrian the ores occur along sheeted zones in the schists or gneisses, sometimes associated with quartz in irregular vein-like bodies, but to a greater extent disseminated through the rocks of the mineralized zones. These zones vary in width, the widest observed being 800 ft. across. They are often persistent for considerable distances, and in several instances the presence of workable amounts of rock carrying above 3% metallic copper has been demonstrated. The usual minerals associated with these ores are quartz, specular iron, limonite, galena and pyrite. Gold is present to the extent of $1 to $4 per ton. The basal strata of the 'red beds' which carry copper minerals are from 30 to 60 ft. thick. At the bottom is an arkose conglomerate and above this there are layers of sandstone and shale. In the northwest part of the district the conglomerate may be seen resting upon the basset edges of the crystalline pre-Cambrian rocks. The ore minerals are locally disseminated through the rocks, and where occurring in the conglomerate appear to have been deposited with the sand and gravel which compose the rock. If this suggestion is correct, the copper minerals were probably derived by erosion from the pre-existing deposits in the crystalline formations. The ore-bearing strata, and especially the shaly beds, contain considerable amounts of fossil wood, and this material has been largely replaced by copper carbonates and glance. The district has been under development for about five years, but as yet there are no shipping mines. Annual assessment work is done on some 200 claims controlled by about 75 individuals. The region is well watered and forested, and the climate is a pleasant one.

Three Weeks in Mexico---III.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

There was not much geology to be deciphered along the railroad from Vera Cruz to Mexico City, except the wonderful constructive features to which the Sierra Madre Oriental and the great Mexican tableland owe their origin. The plains of the coast are made of Tertiary sedimentaries, from the actual dunes of the shore to the foothills of the Sierra Madre, where the railroad enters the Middle Cretaceous, the rocks of which are largely covered by the lava emitted from young volcanoes. At Penuela there is a quarry of Middle Cretaceous limestone, which is the stone employed in building the mole and breakwater at Vera Cruz. Coming west, between Maltrata and Boca del Monte, the railroad cuttings expose intensely folded strata, traversed by faults that divide the Cretaceous series in step-like succession.



A Basket Store.

Above Boca del Monte, the sedimentaries are crowned by remnants of lava streams and volcanic dust, in part consolidated as tuff and in part loose earth, but hardly warranting the idea once prevalent that it had been accumulated by wind or, in geological phrase, was of eolian origin.

Through this volcanic material, hummocks of the Cretaceous make an appearance, as at San Andres. The rest of the journey to Mexico City is made over plains broken by occasional rocky domes and carpeted with volcanic scoria, tuff, and *malpais*.* Such a formation of volcanic dust is often termed 'ash.' Ash is the product of combustion; this material is the result of violent explosion or fragmentary ejection from the vent of a volcano; it is broken rock, which has undergone grinding by abrasion due to the collision of particles in mid-air. It is, therefore, 'dust,' that is, minutely subdivided rock. This material, call it what you may, is of interest to the miner, because occasionally, when mixed with the products of the decay of other more ancient rocks, it carries gold. Near Jalapa a large area is said to give assays of one to four grams gold per metric ton, or per 2,000 lb. Two grams is claimed to be an average and as this material cyanides readily, it may become commercially valuable. An analogous occurrence is found in the massive volcanic rocks of the ranges northwest of Mexico City, where both the precious metals exist along zones of fissuring, to the extent of one or two grams gold and nine grams silver per ton. The metals have been detected in places where solfataric action is in evidence, especially along cracks in the solid hypersthene and hornblendic andesites. The richest material is found in a concretionary form, together with hyaline silica, resembling the glassy quartz of ordinary gold veins. The waters doing this work are cold. It is probable that the gold and silver are derived from the decomposition of the iron pyrite that abounds, finely disseminated, in minute



In the Patio of the Iturbide Hotel.

crystals, throughout the rocks of these localities. Minute crystals of hematite have also been distinguished, more usually in the rotten rock. It can also be said that the greater the decomposition, the greater the concentration of gold and silver in the cracks traversing this formation. In the dry climate of the Mexican plateau, meteoric water dissolves the carbonic acid and, sinking below the surface, it exerts a solvent action. In the Guadalupe range, five miles north of the City, there are narrow solfataric vents, the warm waters of which have deposited silica in the form of quartz together with gold and silver, the first in traces and the second to the extent of eight grams per ton. These occurrences, while of no immediate commercial importance, are interesting as affording present-day manifestations of the manner in which thermal waters make ore. The same process continuing for a long period, and protected from erosion, would lead to the creation of a valuable ore deposit.

One hears much of the sulphur in the crater of Popocatepetl and a company formed to exploit these deposits of brimstone has obtained some notoriety. Not long ago Senors Jose G. Aguilera and Ezequiel Ordonez

*This is the word that in its corrupted form, *malapai*, is used in Arizona and the Southwest generally, to designate the black lava-fields. It comes from the Spanish *mal*, bad, and *pais* country.

descended into the crater and found a deposit of sulphur not more than 15 cm. thick and so distributed as to be of no industrial value. Although exceptionally pure, the sulphur was in the form of small particles mixed with volcanic dust around cold fumaroles; these emitted steam with traces of sulphuric acid, the decomposition of which led to the precipitation of the sulphur. It was the result of deposition for a period of twenty or thirty years. There is a story—and it is Prescott who tells it—of an ascent of Popocatepetl, made by some of the men with Cortez, to secure sulphur; but these explorers did not go to the bottom of the crater, which is 800 ft. below the summit; they went only as far as a fumarole on the lip of the crater. After all, the quantity of sulphur which they needed—and they took—to make gunpowder, was insignificant.

Mexico is the Paris of the American continent. The air is clear and balmy with the feel of the tropics, the early mornings prompt a canter on horseback in the park at Chapultepec, the story of the City gives it the dignity of history and the glow of romance, the actualities of today are touched with the silken hand of luxury; life is rich, gay, and progressive. The brutality of mere materialism and the squalid splendor of newly made wealth are not evident, the invasion of Anglo-American energy and capital has prompted many sanitary reforms and municipal improvements, but the practical man from the North is insignificant in numbers, so that while he may be partly responsible for the cleanliness of the streets, he is unable to spoil the distinction of a community, the members of which go to Paris as to the Lourdes of a fashion saint, bringing home a taste in clothes and horses that enhances the attractiveness of the daily promenade and gives grace to the Spaniard and distinction to the Mexican. Time was when the City of Mexico was far from salubrious, when her streets were badly paved and her hotels among the worst of their kind; but all that has been changed. Of comfortable hostelries there are plenty; the restaurants afford a great variety of good cuisine, and the clubs—the Jockey, the British, the American, and several others—give sojourners the hospitality worthy of a metropolis.

There are many fine buildings in the City. The cathedral and the museum are well known to travelers; the building in which the School of Mining is now situated is more than a century old, and it is full of interesting traditions. One of the founders was Andres Manuel Del Rio, the great Spanish mineralogist, who adopted Mexican nationality; he belonged to the Freiberg school and during Humboldt's time was sent by the Spanish government to Mexico with a view to stimulating mining education. He founded the collection now to be seen in the School of Engineering, which includes that of Mining. There is a story told of Del Rio and Humboldt that is not without humor. Del Rio found a new mineral which he called *plomo rojo de Zimapam* or red lead; it was a vanadate of lead, vanadinite. Humboldt visited Mexico at that time—between 1804 and 1808; Del Rio gave him a specimen and his notes concerning the discovery of the new mineral. Humboldt took them to Europe with him; subsequently, he wrote to say that he had lost these notes and the specimen in some boxes that fell overboard at sea. But, strange to say, some years later the vanadium mineral was discovered in Scandinavia. In 1836 Del Rio made a sarcastic reference to the episode in a paper which he wrote as a sort of protest against the injustice done to him, in calling the new metal after the Scandinavian goddess instead of —for example—Riita. For his was the discovery.

In the museum there are some fine meteorites; one specimen weighs 14 tons; it came from Chihuahua. Another, called the San Gregorio mass, has inscribed upon it the following Spanish rhyme:

Solo Dios Con zu-Poder
Este fierro destxuira
Per ce en el Mundo no Abra
Quien lo pueda Defacer.

I trust no scholar, critical of the Spanish of this quotation, will impute its apparent errors to me. I give the words exactly as I copied them from the inscription. Which may be interpreted: "Only God with his power can destroy this iron, for there is no one in the world who is able to unmake it." It was discovered in the year 1600 and weighs 10,000 kilo.; the locality whence it came was San Gregorio, in De Allende district, Chihuahua.

From the observatory on top of the building there is a splendid view of the city and its environs, especially eastward, where the towers of the cathedral and the domes of the churches of the Profeso and Santa Teresa rise finely above the multitudinous buildings, cut into squares by straight streets, beyond which are the dark foothills, dominated in the distance by the broken crest of Ixtaccihuatl and the big cone of Popocatepetl. To the southeast, one can see Iztapalapan—now Istapalapa—where, on the eighth of November, in 1519, Hernando Cortez met Montezuma, and the pioneer of European invasion exchanged courtesies with the poor king whom he so utterly destroyed within less than a year.

At that time Iztapalapan was a place of twelve thousand houses and it was under the rule of Cuitlahua, the brother of Montezuma. Through the town passed one of the three great causeways that led across the lake to the City of Mexico itself, and it was over this causeway that the Spanish adventurers made their way. Today Istapalapa is a small village and where once spread the waters of the lake, there is marshy ground. The causeway is obliterated by a modern street, that of Acequia, which took advantage of the secure footing thus afforded. It starts from the portals of the Plaza de la Constitucion, as does also, in the opposite direction, northward, the San Andreas street, which merges in the road to Atzeapotzalco; this was the line of the causeway to Tlacopan or Tacuba along which the Spaniards retreated on the occasion of the *noche triste*, that black night of July 1, 1520, that saw them all but annihilated by the fury of the Aztec populace. At Popotla the survivors halted under a tree which survives to this day. It is now guarded by an iron railing, but despite even this protection I read in the daily paper, during my visit, of the arrest of a vandal who wanted a piece of the bark to add to his collection of curios. If ever there was a time in the Spanish conquest when Cortez and his fellow pirates were heroes indeed, it was just after their sad halt at Popotla. Of the number that had entered the City only a third (250) of the Spaniards survived and of their native auxiliaries one fifth (1,000). They had lost most of their horses, all their artillery, all their muskets, so that there remained only their swords and their courage. But Cortez faced the music like a man and was confident even in the hour of deepest gloom. Scarcely one week later, on the plain of Otumba, this handful of men met a multitude of natives, estimated all the way up to 200,000, and beat them off the field, mainly by reason of the desperate resolve of a few of the cavaliers who followed the immediate lead of Cortez and penetrated the thick of the combat in order to kill the chieftains on the opposite side. It may have been comparable to the attack of a centre-rush of a senior football team into the midst of a kindergarten, but it was magnificent by reason of the disparity of numbers and the proof of a superiority of race that was not all physical.

It is a fact, both significant and pathetic, that while

there are today several statues to the last Aztec king—Guatimotzin or Cuitlahuac—more particularly the fine monument in the Paseo de Reforma, and while nearly every city in Mexico has a bust of Hidalgo, the priest who started the final revolution against Spanish rule, there is no statue to Cortez in the whole length and breadth of Mexico.

THERE are various ways of separating gold and silver from metallic copper and from copper-matte. One method is that known as the Hunt & Douglas process, in which the matte is roasted at low temperature, so that copper sulphate and oxide form without producing any silver sulphate. It is then leached with dilute sulphuric acid, the gold, silver and lead remaining in the residue. The copper solution is chloridized by adding calcium chloride and the copper precipitated as sub-chloride by passing sulphurous acid through the solution. The sub-chloride of copper is reduced to sub-oxide by milk of lime, whereby chloride of calcium for further use is recovered, while the sub-oxide of copper has only to be reduced to metal. Another process is that invented by Block & Hartman, for the separation of gold from copper-matte. The matte is roasted to convert the silver present to sulphate, after which it is leached out with water and precipitated on metallic copper, the gold remaining behind in the matte. The residue containing the gold and copper is concentrated in a reverberatory furnace until a small amount of copper is extracted as a copper-bottom which carries nearly all the gold. This gold-bearing copper may be fused repeatedly with pyrite—auriferous or not—and the copper gradually turns to matte, while the gold continues to remain with that portion of the copper that is still metallic.



The Statue to the Last Aztec Emperor.

EDWARD FORBES used to say that no one who has dredged much can ever wonder at so many rocks being wholly devoid of organic remains.



Popocatepetl.

Our New Machine Drill. A Story.

Written for the MINING AND SCIENTIFIC PRESS
By W. H. STORMS.

We had been running our mine for several years — in fact, since it was first opened, by hand drilling entirely, but as the workings were carried deeper the rock was found harder. I had recently been sent out to take charge of the mine, and I finally decided to put in a compressor and machine-drills to hasten the driving of our cross-cut tunnel. The plant cost several thousand dollars, but we didn't care so much about this, as we expected to save a lot of money by the use of the machines. After the usual delays our compressor was set on its concrete foundation, and connected with the water-wheel pulley by belt. The compressor was placed several hundred feet from the tunnel, being situated down near the bottom of the gulch to take advantage of the additional pressure of water. Finally everything was in readiness and our machine-man set up the drill in the face of the hard cross-cut, and the work began. We were fortunate in having an experienced drill-runner. He told me he understood his business thoroughly. After the machine had been working, perhaps 15 minutes, and he had drilled the hole so deep that he had to change the first drill — the 'starter,' he called it — for a larger one, the machine suddenly stopped. It 'bucked' a little, hissed and coughed once or twice, started up again, struck half a dozen blows with lightning rapidity, and again stuck hard and fast. "Hit it!" shouted the machine-man to his helper, who stood, wrench in hand, enjoying the performance.

Before I could stop him, this fellow, the chuck-tender, hit the drill a couple of heavy blows. "It's all right," said the machine-man, in explanation to me. "That's the way we have to do." Then turning to the chuck-tender: "Take the hammer." The latter grabbed up a double-handed six-pound hammer and commenced industriously to beat the drill, about midway between the chuck and the face of the drift. After several lusty blows, which I feared would break something, to my surprise, the machine started again, and ran a little while without further trouble. But just about the time I had made up my mind that everything was all right, and we would have plain sailing, she stuck again. The machine-man muttered something I didn't quite catch, but it sounded to me a good deal like profanity. "Here," he said abruptly to the chuck-tender, "Grab a holt of that wrench and loosen up those clamp-bolts a little." He re-adjusted the machine on the bar, showing that he understood his business. The bolts were again tightened, and drilling proceeded with another new bit, for some minutes, when the machine once more became erratic, acting much the same as before, but by dint of the lusty hammering on the part of the chuck-tender, and expert manipulation of the air by the runner, the work proceeded until something fell from some place overhead. We all looked up, and then all looked down to see what had fallen. It was a piece of a wedge that had been driven between the head board and the back of the drift.

"I knew that that was what was the matter," hotly exclaimed the runner, cursing roundly this time. "You didn't wedge that bar tight enough," he continued, scowling at the chuck-tender.

"You drove the wedges yourself," said the chuck-tender. "Why don't you twist up that screw and make it tight?"

The drill runner only glared at his assistant. Together they screwed up the column-bar till it would ring like a bell.

We had no further trouble with that hole, and not a great deal with the others. During that shift the new machine drilled 30 ft.— five 6-ft. holes. As we were then prepared to run only one shift a day with the machine, the remainder of the round was completed the following day. We put in 12 holes, each six feet long, in that face. The drift was about five feet wide and seven feet high. The holes were all charged with plenty of dynamite, and the entire round fired. When the smoke had cleared away a little we rushed back, but there must have been something wrong because there was not more than half a car of rock broken and the entire round of holes still stood in the face.

I expressed my astonishment, for I had been told that mining with machines was much cheaper than by hand work. The machine-man, however, was wise, and without hesitation assigned the difficulty to the inferior quality of the powder.

I told him it was the same powder we had been using, and then he explained to me that "the powder had been too long in the mine and had got frozen." I hadn't noticed any marked decrease in temperature in the mine, but acknowledged his superior judgment and experience

"We'll just shoot 'em over again," he remarked. "We will break her all right."

Thus re-assured I gave orders to bring down more powder, but I had lost much interest in the proceedings. My eyes were smarting and I was feeling badly — suffering from a nauseating, violent headache, which seemed to momentarily get worse. I groped my way out of the tunnel. The fresh air was most agreeable, but my headache seemed worse each minute. I had a bad case of 'powder-head.' After some time I heard the dull boom of repeated shots fired at the face of the tunnel. Nearly an hour later one of the men came to tell me the round had done a little better and Joe was going to fire the holes once more. Joe was the machine-man. I felt too sick to care very much what he did, but told the man it was all right. The following day we started in on the second round, and made fairly good headway. This round was completed the next day and fired just about quitting time in the evening, but something was still the matter with that powder, for we had no better success than before. I concluded not to do any further blasting until I could get some suitable powder.

The next morning as I was about to enter the tunnel a man walked up and asked if there was any show for a job. I liked his looks, and inquired if he knew anything about running machine-drills. He answered simply "Yes." I said I had one good machine-man, but had been wanting to get another, so that we might run two shifts. "Just now," I explained to him, "there is something wrong with our powder. It is frozen, or something, for it don't break the ground." "That's curious," he said, "I should not think powder would freeze here at this time of the year."

"Well," said I, "if you like you may come in and have a look at the result of the last round we fired last night."

We entered the tunnel together, and after walking several hundred feet reached the face. Here we found twelve horizontal holes bored in the face. They had been fired the night before, but had acted much the same as in the instance of the first round — only a few inches of the collars of the holes had been broken. The stranger looked at the face, seemed amused at something, and asked for the spoon. He inserted this instrument in each hole in succession, feeling round with it as carefully as a dentist probing in the cavity of a sensitive tooth of a wealthy patient. When he had inspected each hole of the round, he said, "I should not expect these holes to break very well."

"Why?" I inquired.

"You didn't give them any chance," he replied. "You never drilled any cut holes."

"Cut holes?" I repeated after him. "What are cut holes?"

"Holes drilled like this," he replied, showing the direction of the proposed holes with the spoon. "I think," he said, "I can make that round break all right by drilling a couple more holes here," indicating the place.

"All right," I replied. "Let us try it."

Just then Joe came in with a box of powder, to recharge the round of holes. I told him we intended to experiment a little by drilling a couple of more holes, and he might take the powder away again. He did not seem over-pleased, but said nothing and retired with the powder. Meantime the other men had carried up the machine and in a short time the new man had set the bar horizontally across the drift and had clamped the machine to it. In what seemed to be an incredibly short time, he turned on the air and began drilling. The first hole was drilled about 30 in. without a stop except to clean out the drilling and to change drills. The machine was shifted and a second similar hole drilled diagonally to meet the first. The stranger said he thought the round would break now all right, but it would be better if two others were drilled near the bottom. However, he thought it safe to try the round as it stood. The holes were charged and fired by the new man. After waiting a proper time—on which I insisted—we returned to the face and the place was heaped up to the back with broken rock; the round had broken. On returning to the office I saw Joe sitting on the steps. As I came up, accompanied by the new man, Joe got up and said, "I guess I'll take my time."

"What for, Joe?" I inquired, somewhat surprised.

"Oh, I think I might as well leave. I guess you've got a better man."

It had begun to dawn on me some time previous to this that Joe was not the expert he had led me to believe he was; but he had many good traits, he was a worker, and I had no desire to discharge him, so I said, "Joe, how long had you run machine-drills before you came here?"

He looked sheepish and with a grin replied, "I never run a drill before, sir, but I tended chuck for a couple of weeks once, and I was awful anxious to get to learn."

"Well, Joe," said I, "you can tend chuck here and learn to be a machine-man, and after a while you will be all right."

On the advice of our new man I bought another machine, and he taught both Joe and his partner how to run them. They drill 50 to 60 ft. per shift now, and seldom fitcher a hole. The stranger is my foreman and he is a good one. I am also learning a few things myself.

A NUMBER of accidents which have occurred recently to British fishing vessels have been attributed to the magnetized condition of the sheath-knives carried by the sailors. Iron, as is well known, is easily magnetized and may acquire considerable strength due only to the earth's field. If it be used anywhere near a dynamo or motor it is almost sure to become strongly magnetic. Now, it has recently been discovered that the sailors' knives may become magnetized so strongly as to influence considerably the ship's compass and that the wrecks referred to above have been brought about in this way. It has been suggested that the sailors be supplied with knives of non-magnetic material, when the danger will at once disappear. Here is an opportunity to revive the so-called "lost art of tempering copper."—*Electrical Review.*

GOLD is green when in very thin sheets and seen by transmitted light. When leaf gold is heated to 316 degrees C., the green is turned into a splendid ruby color.

Corporations.

A 'stock corporation,' formed to carry on a mining, manufacturing or mercantile enterprise, is called a 'business corporation,' to distinguish it from a company formed for banking or insurance, termed 'moneyed corporation,' and from a railroad, telegraph or telephone company, called a 'transportation corporation.' These latter corporations are usually subject to stricter regulations than 'business corporations,' but enjoy more extensive powers.

The principal advantages of corporate form are:

1. The limited liability of stockholders in case the company fails.

2. The simplicity and convenience of dividing the capital into shares represented by certificates and transferable by indorsement, that is, the ability of selling out and buying into a company.

3. The continuance of the organization in spite of change, death or insolvency of its members.

4. That while a subscriber to the stock of a company is liable to the fully paid value of the stock, neither he nor any buyer of that stock, is thereafter liable. It is a great advantage, in investment in stock, that it is possible for a man to engage in corporate enterprise and to know at all times exactly how much he is risking. This is not true of a partnership.

The stock of corporations can be classified thus:

'Common' stock is the general or ordinary stock of a company without special privileges or restrictions.

'Guaranteed' stock is that of one corporation, the payment of the dividends of which are guaranteed by another company.

'Full-paid' stock is that the full value of which has been paid in cash, or has been issued in payment for property without fraud and in good faith.

'Unissued' stock is in itself a nullity, and until issued, represents nothing. It is not treasury stock.

'Issued' or 'outstanding' stock is that which has been bought or subscribed for and the subscription accepted by the company, or which has been exchanged for property, labor, services or other values.

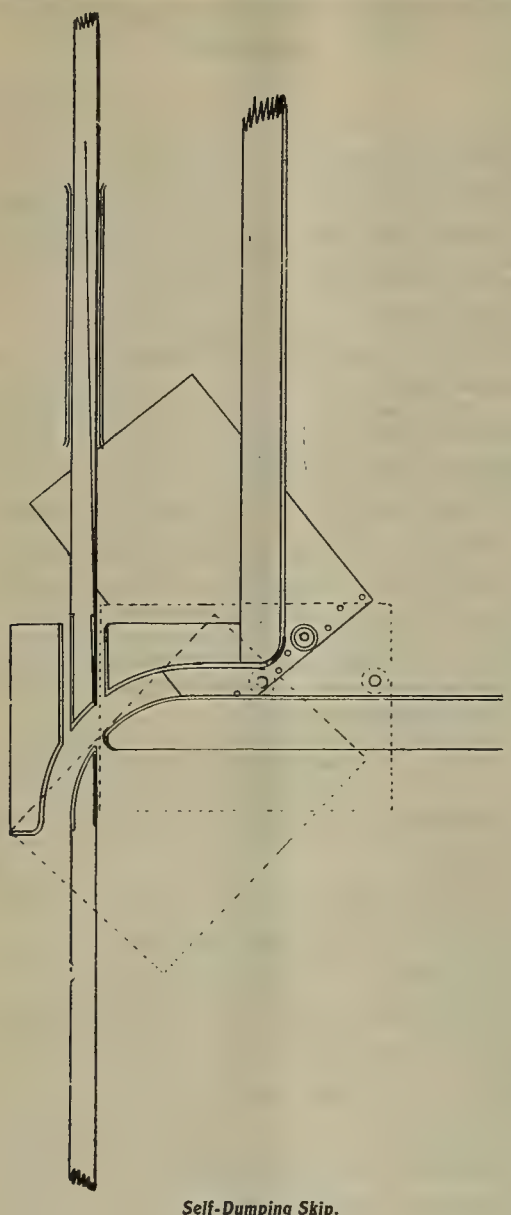
'Watered' stock is that issued without payment or without full payment therefor in cash or in property.

'Preferred' stock is that which receives a specified dividend before common stock can receive any. Its holders may, or may not have the privilege of voting. It is possible for a company to have two or more classes of preferred stock, each drawing a different percentage, the dividend of one class being paid before that of the other. Preferred stock is sometimes arranged to first draw its preferential dividend each year, then to participate in any further dividends declared that year; or, on the other hand, the common stock may draw a dividend equal to that of the preferred stock, and then both stocks participate equally in any further dividends of that year.

'Cumulative preferred' stock. Not only must the dividend on this stock be preferred, but, if profits do not permit its payment at any given year, the lacking amount must be paid out of the profits when they later accrue before dividends can be paid on common stock. This is sometimes called 'guaranteed' stock.

Sometimes it is provided that preferred stock may be redeemed at a fixed price after a term of years, or that it is to have preference in the distribution of assets upon dissolution of the corporation.

Have something to say, and say it, was the Duke of Wellington's theory of style; Huxley's was to say that which has to be said in such language that you can stand cross-examination on each word. This was the secret of his lucidity.

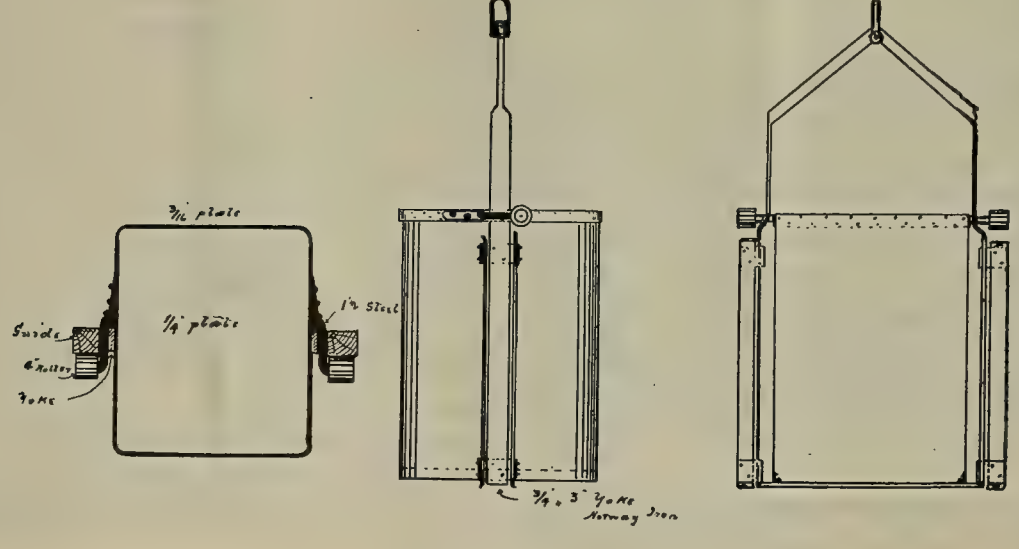


Self-Dumping Skip.

Self-Dumping Skip.

We give herewith the drawings necessary to illustrate one of the latest designs of self-dumping skips. The weight of the skip is 600 lb., the sides are made of steel sheets 3-16 in. thick, the bottom being ¼ in. thick. There is a wooden false bottom covered with No. 10 plate. The bale is made of ¾ by 3-in. Norway iron. The capacity of the skip is 2,500 lb. Willis Lawrence invented this device and Frank Oliver, superintendent of the Florence-Goldfield mine at Goldfield, Nevada, designed the arrangement, and we learn from Mr. Oliver that in raising ore from the 250-ft. level, discharging into the skip from bins at that level, four tons were hoisted in five minutes, 30 h.p. being indicated on the electric hoist. At a recent trial 34 tons were raised in 45 minutes, including the time taken in changing from three levels, namely, at 150, 200 and 250 ft. From the 150-ft. level the average time was 20 minutes in raising 20 tons. Among the good features of the design are these: The weight of the skip is small for the load it carries; the skip and its load are carried by the yoke and there is no weight on the axle; the dumping is expedited.

WASHING SANDY MESABI ORES.—Experiments in the washing and mining of soft, sandy ores of the western Mesabi are still in progress, and the Oliver Iron Mining Co. has ordered a lot of machinery for working these ores. It expects to mine and ship 1,000,000 tons a year or more from one location on the western Mesabi. Every device for handling these ores, both for mining at low cost and for concentrating, is being tried, and without doubt the results will prove exceedingly valuable to all mining men interested in moving and dressing ores on a large scale. Some very interesting new devices for mining may be adopted in this district, and if they prove successful methods of stripping, depths and the general handling and removal of earth and ore may be revolutionized. Three steam-shovels are stripping the Stephens mine on the eastern Mesabi, where developments have been in progress for several years. The mine has been developed in a model way for a very heavy output, but it only produced 87,000 tons in 1903 and 367,000 in 1905. It is capable of an annual product of more than 1,000,000 tons, and so large is the ore deposit that this can be maintained for much more than a generation. The royalty is low, 15c. per ton, which may account for the slight output so far. The annual stipulated minimum is 100,000 tons.

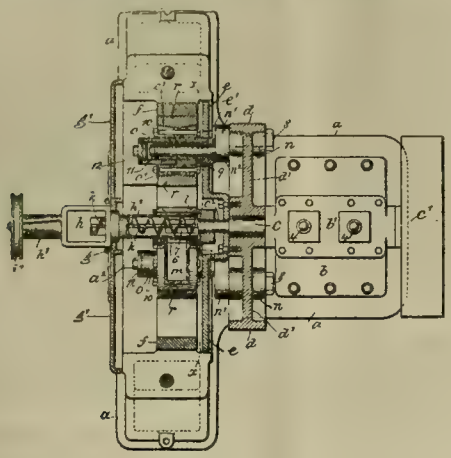


MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

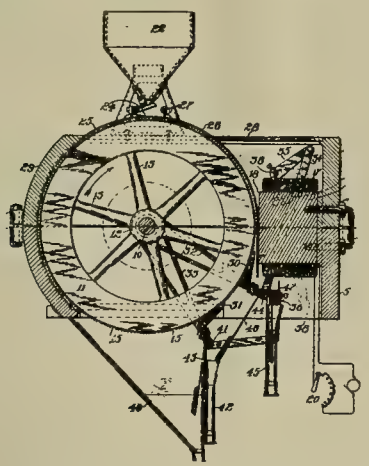
PULVERIZING-MILL.—No. 823,127; Stephen R. Krom, Plainfield, New Jersey.

In a pulverizing-mill, the combination with a shaft, a revoluble device, a series of roller devices mounted thereon, and a fixed ring having a crushing-surface against which the rollers bear, of a tubular hub structure mounted on said shaft and having triangularly arranged faces and perforations, a series of curved tapering hollow centrifugal feeders secured upon the triangularly arranged faces of the tubular hub and curved rearwardly or in the direction of rotation, the discharge-apertures thereof coming adjacent to the crushing-surface and in front of the path of the rollers, a hopper, means for supporting the same, the forward extension of the hopper forming a bearing, a tubular inner prolongation of the hopper communicating therewith, the free end of which passes into the aforesaid tubular hub and is provided with an aperture, a screw conveyor and a shaft therefor within the tubular prolongation of the hopper, and means for rotating the same, for progressing the material to be pulverized and delivering the same through the aperture to the hollow centrifugal feeders.



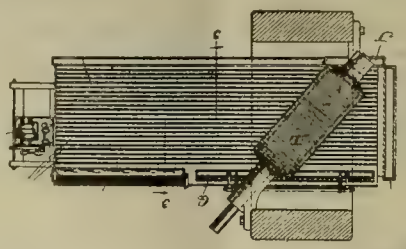
MAGNETIC SEPARATOR. No. 823,303; Frederick T. Snyder, Oak Park, Illinois.

In a magnetic separator, the combination with a hollow iron cylinder having permeable projections thereon, of an electromagnet having a pole-piece external to said cylinder and facing the same, the face of said pole-piece being bare, an energizing-winding upon said pole-piece, a body of magnetic material forming a return magnetic circuit from the rear of said pole-piece to the inside of said hollow cylinder, and means for passing material to be separated between the surface of said hollow cylinder and the face of said pole-piece and into contact therewith.



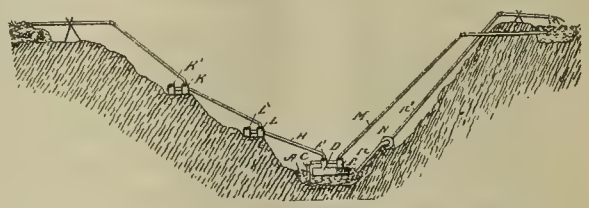
MAGNETIC ORE-SEPARATOR.—No. 823,234; H. H. Wait, Chicago, Illinois.

In a magnetic separator, the combination with a hollow magnet, open at top and bottom, of bare poles of opposite polarity on said magnet, the face of one of said poles being vertical, a shaft adapted to revolve between said poles, having bearings mounted on neutral sides of the magnet, an armature, mounted upon said shaft, permeable projections on the surface of said armature, said projections being of such shape and spaced from said vertical pole such a distance, that material will be attracted from said pole to said projections, a divider mounted adjustably on said shaft, a hopper hinged to said divider, an apron hinged to said divider, and engaging another hopper, links attached to said divider, means for moving said links, means for rotating said armature, and means for feeding material to be separated to said armature.



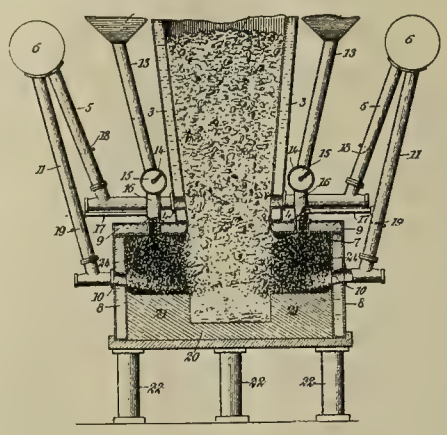
MINING APPARATUS.—No. 823,960; Alexander McDougall, Duluth, Minnesota.

A mining apparatus comprising a mine having water therein, a scow floating therein, a suction pump carried by the scow, a pipe leading from the pump into the water, a partly flexible pipe leading from the pump to the dump, a reservoir receiving the water from said dump, a pipe in communication with the reservoir and the pump on the scow and adapted to operate the pump, and a pump adjacent the pit and adapted to draw the water from the mine and discharge it into the reservoir.



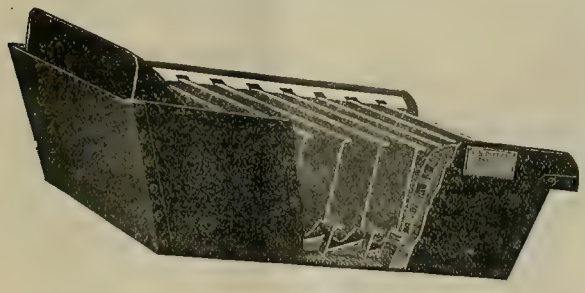
BLAST-FURNACE.—No. 824,485; W. Kemp, Tucson, Arizona.

In a furnace, the combination of a smelting-chamber, twyers for delivering air thereinto, a conduit for feeding coal to said furnace, branch conduits connected with said conduit and opening directly into said smelting-chamber, spiral feed-screws mounted within said first-mentioned conduit and adapted to distribute said coal through said branch conduits, and separate pipes connected with said twyers and with said branch conduits.



An Amalgamating Machine.

The saving of fine gold is a question that is always of interest to mining men. The lessees of the Smuggler-Union mill, near Telluride, Colorado, have installed twelve 20-ton Pierce amalgamators below their plates, and during the months of February, March, and April these machines saved 1,003 oz. gold worth $12 per oz. at the U. S. Mint. The mill consists of 12 batteries of five stamps each, and at the end of each plate one of the amalgamators receives the pulp, which then goes to the concentrating tables, and from there to the cyanide-plant. There is an extra Pierce machine on hand, so as to permit of a clean-up without stopping the battery. The amalgamator occupies but two to eight square feet, according to the size of the machine, and has a length of 11 to 14 ft. of amalgamating surface. It is made of varying capacity and is suitable for any mill, as there is no splash required. In many cases it is set below the mortar instead of using plates, or it can supplement the plates as at the Smuggler-Union. It is also used in placer mining and on dredge-boats and in cyanide-plants. The riffles, used in the machine, are made of copper, either amalgamated or silver-plated, as desired. The riffles are held in place by holders placed in an iron box, which has a slope of from two to four



Pierce Amalgamator.

inches per foot, according to the material to be run through. As the accompanying illustration shows, the lower riffles are bent something like the letter Z. At the top, the copper is bent back so as to form an air space; the bottom of the riffles is turned up at each end and brazed, so as to hold quicksilver. The upper riffles can be made of wood or, preferably, copper. All gold, sand, and water passes through the boxes underneath the upper riffles and over the under riffles. As the pulp passes into the riffle box, it fills to the tops of the first riffle, and then passes under it, between the first lower riffle and then between the first and second upper riffles, and to the top of them, then between the next lower riffle, and up again, and through the second and third upper riffles, and so on between all of the riffles to the end of the box, the gold adhering to the riffles, also sinking into the quicksilver, while the sand and water are thrown out. These machines are being manufactured by L. S. Pierce, at Denver, Colorado.

Commercial Paragraphs.

THE San Francisco office of the PACIFIC TANK CO. is again at its old quarters, 301 Market street.

THE Pacific Coast office of the WELLMAN-SEAVER-MORGAN CO. has removed from its temporary location in Oakland and is now permanently located in the Atlas Bdg., 604 Mission St., San Francisco, California.

THE DEREMER WATER WHEEL CO., of Denver, has shipped water-wheels to the following: One Special phosphor-bronze 12-in. motor to operate under an effective head of 770 ft. and develop 100 h.p. for the Bingham Metals Mining Co., Tooele, Utah. Six special 20-in. water-wheels, in batteries of three each, forming one unit of power for the High Creek E. L. & P. Co., Richmond, Utah. One 6-ft. water-wheel for the Bunker Hill Con. mines, Austin, Nevada. This wheel was delivered on a rush order for express shipment. Two 6-ft. double-nozzle water-wheels for the Hancock Gold Mining Co., Alpine, Colorado.

THE PELTON WATER WHEEL CO. has practically completed its new works at Nineteenth and Harrison St., San Francisco, and will be in complete running order by Sept. 1. These shops were under construction before the fire, according to plans carefully prepared; consequently, they are to be permanent—not designed under emergency conditions—and will afford the most modern facilities for handling and turning out high-grade work.

THE United States Treasury Department has awarded the annual contract for boiler compound to the GEO. W. LORD COMPANY, of Philadelphia. An analysis of feed water for each of the many Government buildings is made several times per year by Lord's laboratory and special chemicals for each case supplied by them. The Geo. W. Lord Co. claims to be the originators of manufacturing boiler compounds in this scientific manner.

THE COMPRESSED AIR MACHINERY COMPANY, of San Francisco, has elected the following officers: P. H. Reardon, President; J. M. O'Brien, Vice President; Eldredge Green, Secretary; Crocker-Woolworth National Bank of San Francisco, Treasurer. The directors of the company are: C. E. Green, Wellington Gregg, Jr., J. M. O'Brien, J. E. Green and P. H. Reardon, who retains the management. The day after the fire they rented various small shops on the outskirts of San Francisco to fill orders for special parts, make patterns, etc. This company had the first building in their line, erected and in operation in the burned district. Their new machines are of the latest type and equipped with individual electric power on each machine. They are now ready to deliver their celebrated Giant Air Compressors and Drills, Word Bros.' Improved Drill Maker and Sharpener, Brownell Engines and Boilers, Shaw's Air-Hammer Rock Drills, Hendrie & Bolthoff Hoists, etc. Their new factory is at the northwest corner of Jessie and Ecker St., between First and Second, Mission and Market streets.

Trade Treatises.

We are in receipt of Catalogue No. 58 of THE MURRAY IRON WORKS CO., of Burlington, Iowa. This catalogue is handsomely finished and covers the engine and boiler field in a most thorough manner.

ALLIS-CHALMERS CO. of Milwaukee, Wis., has issued Bulletin No. 1,052, descriptive of the type B electric generators and motors, made by them, and illustrating this type of motor applied to the operation of a drill-press.

'Unions for Steam Pipes.'—This is an interesting little pamphlet issued by the JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., which describes and illustrates various kinds of union couplings used on steam-pipe lines.

Publications Received.

STEAM CONSUMPTION TESTS.—A paper read before the South African Association of Engineers, of Johannesburg, by E. T. Laschinger, A. M. Robinson, and H. C. Behr. It describes in detail the results obtained in a test of hoisting on the Rand at shaft No. 1. of the Village Deep mine, the object being to determine the average rate of steam consumption of a modern high-class, direct steam-driven winding apparatus, under ordinary working conditions, when hoisting ore from a vertical deep-level shaft.

WATER SUPPLY AND IRRIGATION PAPERS, No. 165 and 166 of the United States Geological Survey, being reports on the progress of steam measurements in 1905. Also production during 1905 of precious stones in the United States; of abrasive materials; of monozite, zircon, gladolinite and tantalum minerals, and of talc and soapstone.

TO OBTAIN a private water-supply a deep well is often driven until a sufficient quantity is obtained. As the well is driven, an 8-in. pipe is sunk to form the casing. When the water-pocket has been reached the water will usually rise and stand in the pipe several hundred feet above its bottom, and the amount of water that can be usually pumped from such wells, without lowering the water, is practically unlimited. The cost of drilling deep wells per foot of depth including the casing is, for a well with 8 in. casing, $4.50 per foot.

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Editorial.

THE DISCOVERIES of gold and silver in the Temagami, Temiskaming and Abitibi districts of northern Ontario are extending the boundaries of the mining regions into the great wastes of northern Canada. The most recent find near Lake Opastica, in the adjoining portion of Quebec, is another pointer that way. New Ontario, as this tract is now called, promises to add greatly to the known resources of the Dominion and the day may yet come when the lonely shores of Hudson bay will be enlivened by the miner's activity.

AMONG THE INVESTIGATIONS in progress under the direction of officers of the United States Geological Survey is the completion of the report on Butte by Mr. S. F. Emmons, who will also supervise the examination of the Ely copper deposits. Mr. Charles Palache is making a mineralogical study of the native copper lodes of upper Michigan. Mr. J. M. Boutwell is attending to occurrences of lead and zinc at Joplin, Leadville, the Cœur d'Alene, and Park City. Among the new gold mining districts, Mr. F. L. Ransome will make a geological examination of Manhattan, Goldfield, and Bullfrog, in Nevada.

INVESTIGATION into the origin of tin ores should receive an impetus from the discovery, by Mr. Richard Pearce, of pseudomorphs after one of the sulpho-stannites which occur in Bolivia. Heretofore feldspar and specular iron were the only minerals known to be replaced by cassiterite and the discovery is therefore of importance because it affords evidence of the secondary enrichment of tin ore through the oxidation of tin sulphide and the removal of associated metals. The origin of tin deposits has never been explained with certainty and it is peculiarly appropriate that a mineralogist and metallurgist so long an authority on the subject, should have lighted on this important find.

AN INTERESTING QUESTION of title is suggested by a paragraph in *The Sun*, of Yuma, Arizona, which publishes a statement to the effect that a Mexican discovered some rich mining ground in the northern part of Yuma county, and having an opportunity to sell, did so, receiving part payment in cash. When it was discovered that the locator was not a citizen of the United States, several parties raced to the find to re-locate it. 'Lindley on Mines' says: "We think the following principles have been established by weight of authority: (1) That a location made by an alien, if otherwise valid, creates in him an estate which can be divested only at the instigation of the Government in a proceeding in which it is either directly or indirectly a party. (2) That such estate when vested in a citizen is as complete as if originally acquired by him by location, and no one, not even the Govern-

ment, can assail his title." A location made by an alien is free from attack by anyone save the United States Government. In the Arizona case, therefore, the Mexican might have held onto the claims located by him until 'office-found,' as proceedings in cases of this kind by the Government are called, and the purchaser from the Mexican has good title to the ground in question and may yet oust the jumpers by legal process.

OUR CONTEMPORARY in London, *The Mining Journal*, has added to its staff a consulting engineer to advise on motor transport. This is an interesting sign of the times. While not likely to follow even so good an example, we can state that among the mining engineers resident in our vicinity there are several who could give a good deal of advice on the use of the automobile in mining regions. Most of our leading men have their own cars and in Nevada the automobile is used as much in killing the distances of the desert as the camel in Western Australia only ten years ago. Apart from its convenience in affording quick access to distant mines, the motor car is becoming used for transport of freight and supplies; it is destined to play an important part in the development of the waste places of the earth.

Irish Copper Mining.

The article by Mr. Philip Argall is full of interesting information and it is timely, having in view the fact that copper mining in Ireland has become a success recently. Our London correspondent, in his weekly letter, gives news to this effect. But apart from the opportunity for successful investment, the copper mines of county Wicklow are to be credited for several inventions now widely used. The first patent for wire-rope tramways was granted to Charles Hodgson of Wicklow. It is true, a bas-relief unearthed at Nineveh depicts a rudimentary form of rope-haulage used during the siege of that city over 3,000 years ago, and wooden blocks and ropes constructed of fibres obtained from the date palm, have been found in Egyptian ruins, indicating that rope-haulage was not unknown at an early date. It may be noted also that an old-fashioned print illustrates a fibre-rope with dependent buckets, erected for the city of Dantzig by Adam Wyhe in 1644, and used for carrying earth to the ramparts. Nevertheless, it was not until wire-ropes were made that tramways came within the range of modern engineering. Hodgson received an English patent in 1868, and it is likely that his inventive spirit was stimulated by the energy of the people who worked the Wicklow mines fifty years ago. Another supposedly recent invention originated in these old copper mines. The technical press has lately published descriptions of the mono-rail as used in South Africa, where the device has been introduced successfully. Capt. George Oates, of the Cronebane mine, appears to have been the first to apply the idea to mining and our friends at Johannesburg will be glad to examine the sketches and description contributed by Mr. Argall. Apart from this point of interest, the main subject of precipitating copper from mine-water is deserving of careful reading by the younger mining engineers, because it affords a good example of the application of chemical knowledge and mechanical ingenuity; although simple, it illustrates the saying that science is a specialized form of common sense.

Progress in Cyanidation.

The comment on current practice at Kalgoorlie by Mr. Alfred James, will interest cyaniders. We also publish a description of a new method of lining tube-mills, as devised by Mr. H. P. Barry, of the great Waihi mine, in New Zealand. One of the practical problems, especially to millmen operating at a distance from manufacturing centres, is the cheapest and most durable lining for the tubes. At first everyone depended upon Iceland pebbles and silex lining from Europe; and to those in charge of mills on the other side of the world—in Australia, New Zealand, and Mexico, for example—it was a serious handicap to depend on supplies from so great a distance. Iron linings of special composition were not much better, for they also were made by methods not available at the ordinary mining town. Both in Mexico and New Zealand the mill-managers have succeeded in breaking away from the tyranny of a special material and they have been able also to procure flints suitable for their purpose. The device invented by Mr. Barry is one of the best improvements in tube-mill practice, and, as it is applicable to other localities, we hope it may prove extremely useful.

In regard to cyanidation generally, Mr. James' remarks are much to the point. The frequent comparisons between the work done by the pans and tube-mills at Kalgoorlie have evidently been of little value as indicating the general applicability of the two machines, simply because the peculiar conditions obtaining at Kalgoorlie have been overlooked. Mr. James sets that matter right. His other criticisms are welcome, and any reply to them will be given a courteous hearing.

It appears likely that tube-mills will be discarded at Kalgoorlie because the tellurides occurring in the ore require roasting; the idea used to be to comminute excessively so as to dissolve these tellurides raw, but now solubility is secured by obtaining the porous condition due to a roast. Filter-presses are already a back number in Western Australia, and elsewhere. Filter machines of the Moore, Butters and other types are displacing the old devices. In fact, cyanide practice is undergoing a continual and rapid development, one device after another being elbowed out of the way to make room for something better. Just now it is manifest that it is cheaper to treat slime by agitation than to treat sand by percolation; it is not only a question of relative cost between re-grinding *plus* slime-treatment on the one hand and percolation of the coarse stuff on the other; the assertive factor is the increase of crushing capacity in the first instance—whether under stamps or between rolls—due to relieving the first crusher of the work of pulverizing. On these subjects we hope to hear from our friends. Experiments are continually under way; the exchange of experience will prove mutually helpful.

By the Way.

IN a recent address to the graduating class at Lehigh University, Dr. R. W. Raymond gave some good advice to the young men about to become engineers. Among other things, he said: As advisers of clients, you will encounter little difficulty in deciding what professional honor requires of you. Yet, now and then, perplexing cases may arise. For instance, you are called upon to estimate the prospects and suggest the best method of exploration of a mineral property owned by your employer. He asks you, not how much money the property is worth, but whether, in your judgment, it is promising enough to warrant the expenditure of money upon it by the actual owner. You make an encouraging report, which he afterward publishes, in whole or in part, to aid the sale of the property or of the stock of a company to which he has transferred it, at a price never considered by you, and beyond your estimate of its present value.

In view of such a possibility, you ought, in the first place, to put into a report of this class no vague, glittering prophecies of future profit, or paragraphs which could be used, without their context, to support sanguine speculative appeals. State clearly, at the beginning of such a report, its purpose and scope. If your employer should subsequently make such use of it as would involve you in propositions you never made or meant to make, protest promptly. Such a protest, to be effectual, should be re-enforced by your own original and carefully guarded statement. Nevertheless, make it anyhow, and make it promptly, if you deem it worth making at all. Post-mortem disclaimers by experts, after the collapse of mining schemes with which their names have been fairly or unfairly connected, have very little effect. You cannot be too careful to make your record absolutely plain, and to protect it, by instant protest and exposure, against even the appearance or suspicion of connivance in delusion or deceit.

Again you may have occasion to appear as expert witnesses in court. Such witnesses are called in cases involving patents, mining titles, the detection of poisons, the details of medical practice, or the value of professional services, etc.

Expert testimony has been, and is, the subject of endless controversy. It is often urged that experts should be appointed by the court, to give advice without favoring either party. This is, in fact, done in criminal cases, where analyses are made for poison; in cases of alleged lunacy, etc.; but I think experience has shown that in ordinary itigation, especially as to patents and mining titles under our laws, justice is best secured by allowing each party to present its own experts, requiring them to submit to cross-examination, and leaving the bench and jury box to pass judgment upon the evidence. The difference between an expert and an ordinary witness is that the former is permitted to give his opinions, however reached, while the latter can give only facts of personal knowledge. The oath of an expert, therefore, binding him to tell "the truth, the whole truth, and nothing but the truth," covers the ordinary obligation as to facts, and also the obligation of the full and truthful statement of expert opinion. Yet there is no doubt that this opinion must be, to some extent, a partisan one. No party to a lawsuit will put an expert on the stand without knowing beforehand that his opinion will be favorable to the contention of his employer. Nor would any such expert be doing his duty, either to the court or to his employer, if he uttered an opinion so carelessly formed or loosely held that he could not vigorously defend it, or would run the least risk of changing it under cross-examination. The situation is often complicated, critical and exciting. The following suggestions may assist young experts to deal with it:

When such an engagement is offered to you, accept first a retainer for which you undertake to examine the case, form an opinion, and state it to your employer. In a mining case, two such preliminary investigations may be necessary; the first being based upon the *ex parte* case, submitted to you by one side, and the other upon your own personal examination of the facts. After the latter, state clearly to your client the opinion which you are prepared to maintain. If it does not support his contention, he will not wish to put you on the stand as a witness; but you are bound not to assist, either in that case, or (without his permission) in any other, involving the knowledge you have acquired in confidence from him, parties whose interests may be hostile to his.

If you take the stand as an expert, you ought to know already all the facts and authorities which bear upon your opinion. Whatever has been previously adduced in the pending case, you should, of course, have taken into account. What is produced which takes you by surprise, you should not meet with a rash denial or quibble. Your true and wise course is to declare that you are giving your deliberate and careful opinion upon all the facts known to you, and you can not hastily revise that opinion upon new evidence, which you can not, in a moment, test, sift and weigh.

Don't try to be smart or witty under cross-examination. Such an encounter is like a fencing-match in which you have your hands tied. For you are answering under oath, while the inquiries and insinuations of your antagonist are unrestrained. Maintain your opinion manfully but do not even seem to be fighting for your client. Stil better: do not fight at all, but assume throughout that the cross-examination attorney is honestly in quest of information, and give it to him with courteous generosity. If you thus give him no opening for insulting comment, he will probably not make any. If he should do so, do not try to protect yourself, but let your counsel or the court protect you. I have seen a witness get the better of a lawyer in repartee and lose the case; and I have seen witnesses browbeaten and embarrassed by clever lawyers, but vindicated by the verdict of the jury, which could not be diverted by mere wit from its search for truth and justice.

THE British South Africa Company reports that the Cape to Cairo Railway has reached Broken Hill. This district must not be confounded with the great silver mining centre in New South Wales, Australia. The African Broken Hill contains large outcropping masses of zinc-lead-silver ore; it is 374 miles north of Victoria Falls, and 2,016 miles from Cape Town, and its connection by rail with the south constitutes a further step toward the fulfilment of Mr. Rhode's great scheme. The rails reached Kalomo, 93 miles north of the falls, on May 29, 1905, since which date rapid progress has been made. On July 1, 1905, the further extension was begun, and the 281 miles from Kalomo to Broken Hill were constructed in 346 days. On 99 days, however, no plate-laying was done, so that the rails were actually laid at the rate of more than a mile a day. On September 26 last five and three-quarter miles were put in between daylight and dark, constituting a record for rapid plate-laying in South Africa. Three thousand to 5,000 natives were constantly employed, and about 350 whites.

PHILOSOPHY never rests. Its law is progress; a point which was invisible yesterday is its goal today, and will be the starting-post tomorrow.

Special Correspondence.

LONDON, July 11.

The Committee, composed of bankers, business men, a chartered accountant and a barrister-at-law, which was appointed in February, 1905, by the Board of Trade to consider the position of joint-stock enterprise, as affected by the Companies Act of 1900, has issued its report. The Committee points out that the number of companies that invite the public to subscribe has fallen from 11% in 1901 to 8% in 1905, while the companies that do not invite the public to subscribe have increased in the same time from 50 to 76%. Then the total amount of nominal capital shows an enormous and, with one exception, a continuous drop; in 1896 it was £285,000,000; in 1905 it was only £108,000,000. During the same time the average amount of nominal capital to each company fell from £66,000 to £27,000. The Committee thinks the reasons are: (1) War loans have diminished the capital available for investment; (2) the raising of the registration duty by the Finance Act, 1899, from 2s. to 5s. per £100; (3) the stringent provisions of the Companies Act, 1900. It is therefore recommended that a director whose breach of any duty imposed upon him by the Companies Act is the result merely of honest oversight, inadvertence, or error of judgment, shall be removed from liability. "We think, too," says the Committee, "that various recent decisions on the Income-Tax Act, to the effect that a company registered or controlled in England and doing business abroad is liable to be taxed on the whole of its earnings, whether made abroad or in the United Kingdom, and wherever its shareholders may be domiciled, have adversely affected the registration of companies in this country, and have led to their reconstruction so as to place them under colonial or foreign law. These decisions have also to some extent encouraged the formation abroad of companies which might otherwise have been registered here." For the protection of unsecured creditors of a company the balance sheet, the Committee recommends, should be filed with the Registrar.

As anticipated when the Bonmahon Copper Mines Development Syndicate, Ltd., was formed in November, 1905, (noticed in my correspondence on February 6), a considerable amount of money has recently been embarked in Irish copper mining. There was a time when the recovery of copper in Ireland was one of the country's staple industries, but that period is rather remote. The possibilities of the lodes are now being recognized, and not only are English companies interesting themselves in the re-opening of them, but it is reported that American syndicates are also on the point of unwatering mines and commencing production. It is stated that more than one offer has been made to the present proprietors of the Bonmahon lodes for the purchase of the undertaking at a very substantial profit. The Schull Copper Co. is also a concern formed with the moderate capital of £5,250, to work the copper deposits on the island which gives the company its name, but, beyond the fact that the lodes are situated on the mainland opposite to Schull, little information is obtainable. The next property to be taken in hand, it is said, will be the Ballygahan.

The trading carried on by the Niger Company, Ltd., must be of considerable importance, judging from the payment of £106,802 as customs duties in Nigeria for the year 1905. The company reports the acquisition of licenses to mine and the prospecting and mining operations carried on in northern Nigeria have made good progress. Extensive deposits of tin have been shown to exist, but at a long distance from water carriage. When the difficulty of providing efficient land transport shall have been met, it is thought the chief obstacle to rapid development will be removed.

Also situated in the equatorial region of the Dark Continent, the West African Hinterland Consolidated is an instance of unfulfilled promises and expectations. Notwithstanding the favorable reports on the company's properties (which covered an area of 100 square miles), on the strength of which the original working capital of £30,000 was subscribed, no large body of payable ore has been found. Funds have become exhausted, and there seems to be no possibility of obtaining further capital. Little or no financial support has been rendered by the shareholders, in spite of frequent appeals by the directors for their co-operation, and "with feelings of deep regret" the directors propose to put the company into liquidation. It is to be feared that a like fate will, with effluxion of time, befall other West African development companies which started out to explore large slices of the continent with more enthusiasm than hard cash.

The meeting of shareholders in East Pool and Agar United mines is described by an eye-witness as one of the most enthusiastic ever held on the property, and the 'adventurers' were not only well pleased with the dividend of 12s. 6d., but gratified at the manager's report on the underground workings. During the twelve weeks a profit of £6,497 was made. A proposal put forward by a London-Cornish shareholder to move a resolution instructing the committee to take the necessary steps for the conversion of the mine from a cost-book to a limited liability company was rejected with scorn. Limited company, forsooth! when the adventurers were enjoying the prospect of a distribution among themselves of £4,000 out of profits, bringing up the record of dividends to half a million sterling on a paid-up capital of a few thousands of pounds. Enough to make their great-grandfathers turn in their graves! The audacious Cornish-London shareholder probably returned to 'town' with the reflection that the cost-book system will be good enough for East Pool and other mines while the times are prosperous, but if history should repeat itself with its wonted regularity, and the shareholders get tired of paying calls in search for new 'bunches of tin,' they will have to seek outside help, and such help will only come through the adoption of limited liability.

At the 'ticketing,' or sale by tender last week, 255¾ tons of black tin were disposed of at the average price of £102 11s. 5d. The list is useful as an indication of the relative importance of the active mines in Cornwall at the present time:

	Tons.	Amount. £	s.	d.
Dolcoath	72	7,667	2	6
Carn Brea and Tincroft	32	3,016	6	3
Grenville United	31	3,229	5	0
Basset, Limited	28	2,682	5	0
East Pool and Agar United	23	2,369	17	6
Levant	18	1,949	12	6
West Kitty	15	1,614	7	6
Clitters United	11	1,212	15	0
Bottallack	8	788	0	0
Wheal Crofty	8	762	7	6
Burney	3	305	5	0
Porthledden	2	202	0	0
Wheal Kitty	1½	153	7	6
Mulberry	1¼	104	1	3
Wheal Bellan	1	106	15	0
Tehidy Tin Streams Syndicate	1	69	5	0
Total		£26,232	12	6

Shareholders in Cosmopolitan Proprietary, Ltd., have met with an experience not uncommon in West Australian mining. This time last year the lode formation had entirely given out in the shaft, in consequence of which the engineers recommended that the shaft should not be sunk further. At that time it was intended to sink a shaft from the drift at a place where the new orebody was cut; but in the course of development and the sinking of the winze below the 11th level a well-defined lode was found to exist, and authority was given to continue the sinking of the main shaft, with the result that the lode formation has been found in the shaft again. At the annual general meeting, the chairman was able to congratulate the shareholders on the fact that, whereas last year they had no indications of the existence of ore below the 11th level, they now know that it continues to the 12th level, and the shaft being down to a depth of 1,732 ft. on the dip, they are in a position to continue the drifts so as to open up a new mine. In the course of his remarks at the meeting, the company's consulting engineer, Mr. C. A. Moreing, said he wished to point out that in Australia — in Western Australia particularly — gold deposits consist of lenses, which die out and re-make. There was a blank space at the bottom of one of their lenses and, in sinking, they had come on to what apparently is another lens. At present that lens is very low-grade ore, but low-grade ore in the Cosmopolitan is valuable, as the working expenses are so low. Mr. Moreing said that when he went through the Cosmopolitan with the manager, that gentleman enthusiastically pointed out patches of ore which, he said, were rich ore. That ore carried less than 6 dwt. of gold, yet he could see a satisfactory profit to the company from working

it, though it was material such as could not be worked at a profit on the Rand, with all its advantages of cheap labor.

A smart rally (owing to bear coverings), took place in Kaffirs yesterday on the record output of June — 475,975 oz. gold, as against 461,202 oz. for May. The first crushing of the Cason mine is included for 13,130 ounces.

The approximate figures of the returns for the month of May are to hand from Dolores, Mexico: Ore treated, 982 tons; total receipts, $39,500; expenses, $20,000; profit, $19,500. The report states that the definite milling figures are not yet to hand, but about 600 tons of the above mentioned total were treated by cyanidation, and that the decreased tonnage treated by amalgamation is due to interruptions caused by starting the cyanide plant. Owing to adjustments and experiments incident thereto, the full capacity of the mill was not reached.

TORONTO, July 20.

The Ontario Government has dropped proceedings to invalidate the title of the Nipissing Mining Co., of Cobalt, to its locations, the company having satisfied the Government that it was a bona fide purchaser, without notice of any defect in the title, having paid $250,000 for the claims. This action has had a reassuring effect, as indicating that where it can be shown that the rights of innocent purchasers are involved, the titles under which mining properties are held will not be disturbed on account of mis-statements or fraud by the original claimants.

Much activity is being shown in providing local smelters for the Cobalt ores. The Montreal Reduction & Smelting Co. has secured a site for the erection of a smelter at North Bay, and is applying to the Temiskaming & Northern Ontario Railway Commission for the construction of a siding to its works. —— The North Ontario Reduction & Refining Co., with John I. Davidson as president, and a capital of $500,000, will build works at Sturgeon Falls for the treatment of both Cobalt and Sudbury ores by the hydro-electric process as applied by the Idaho Reduction Co. at Clarkston, Wash. The plant is to be erected by Holman & Young, owners and partners of the process. Other companies are making application for sites in northern Ontario.

The Temiskaming & Northern Ontario Railway Commission, which has the disposal of mining rights on the Cobalt town-site and the railroad right-of-way, has leased the mining privilege between the 101 and 105th miles on the railroad, embracing the portion lying within the Cobalt area, to the Right of Way Mining Co. The company, which is not yet incorporated, is composed of Ottawa capitalists, including J. P. Dickson, A. W. Fraser, G. P. Murphy and Newton Kerr. The company obtains a 999-year lease and pays a cash bonus of $50,000 and royalties on the ore mined on a sliding scale, according to value at the mouth of the mine, varying from 10 to 50%. All ore assaying over $1,000 per ton will pay the latter figure. It is understood that the northwest 40 acres of the Cobalt town-site have been leased on similar terms as to royalties, the cash bonus being fixed at $22,000.

Dr. W. A. Parks estimates the value of the Cobalt area, including three square miles about Cobalt town, at $50,000,000. The indications at a depth of 250 ft., he says, point to an inexhaustible supply. [This has been said of every mining camp that ever started.—Editor.] He believes that the mineral territory reaches at least as far as 50 miles north of Cobalt, and anticipates that rich finds will be made in the neighborhood of Lake Abitibi.

In the Manitou gold area, Rainy River district, several American companies are actively at work. The International Mining & Milling Co., the headquarters of which are at Detroit, has been doing extensive development work on its properties at Lower Manitou lake. It has completed a dam for the development of electric power and contracted for mining machinery. —— The Golden Rose Mining & Development Co., of Escanaba, Mich., which has over 400 acres of mineral lands in the Manitou area, has struck three or four promising veins near the Twentieth Century gold mine. —— The Standard Consolidated Mining Co., George W. Cooper manager, has secured six choice locations and has arranged for the commencement of operations in the neighborhood of the noted Laurentian mine.

BUTTE, July 23.

The Anaconda Copper Mining Co., through an arrangement with the Red Metal Co., will use the shaft of the Belmont mine to work a portion of the Anaconda mine. The Belmont is situated in the southeastern portion of the Butte district, and is surrounded by Anaconda property and underground Anaconda workings. Several years ago the United Copper operators of the Belmont, while developing that mine, broke into workings of the Anaconda at a depth of 900 ft. It is the intention of the Anaconda Co. to make other connections, deepen the Belmont shaft, and at the same time exploit the Belmont for the Red Metal Co. —— The Red Metal Co., operating the Minnie Healey mine, has opened a large body of rich ore at a depth of 1,100 ft. The vein was mined under United Copper ownership, but the new owners have opened an orebody 30 ft. wide, seven feet of which averages 7% copper.

The Basin concentrator, owned by La France Co., has been closed temporarily, as it was found impracticable to continue operations after the Red Metal Co. discontinued shipments and sent its ore to the Washoe smelter at Anaconda. The Basin concentrator will not be operated again until the smelter there is equipped to handle the ore from the Davis-Daly Estates mines, and the Lexington mine owned by La France Co.——The shaft of the Ophir mine, at the foot of Dakota street, in the city, has reached a depth of 485 ft. The operators had expected to cut a vein before reaching that depth. A station will be cut at 500 ft., after which sinking will be resumed and continued to 1,000 ft.—— The Davis-Daly Estates Co. has decided to sink a shaft on the Silver King claim and another on the Mt. Moriah. On both claims there are small shafts which will be enlarged and sunk to 1,000 or 1,500 ft., the depth to be determined by conditions as the work progresses. Temporary machinery will be used at first and later large permanent hoisting-plants will be installed. —— The Parrot Mining Co. is precipitating cement-copper from the tailing dump of the old Parrot works and making a good profit. Up to a few weeks ago lessees were permitted to work on the dump, but it was found that there was sufficient profit in it to justify the company in taking hold of the enterprise. Lessees expended $30,000 in the precipitating plant, which was taken over by the company at the cost of their investment.——The Boston & Montana Co. is shipping the tailing from the site of its old works at Meaderville to the smelter at Great Falls. It had been lying undisturbed for 14 years, and much of the copper has been leached out and carried away in the waters of the creeks, but the material left still pays the company a good profit in shipping to Great Falls, where it is used for furnace lining, being especially suited for that purpose. —— The Butte & London Co., which is developing the Greendale placer claim in the eastern part of the Butte district, has reached a depth of 475 ft. and the bottom of the shaft is in solid rock. A new engine at the shaft is ready for work, but the company is awaiting the arrival of a compressor. Meantime work will continue with the old engine.

The shaft of the Butte Copper Exploration Co., situated just east of the Butte & London mine, is down 730 ft., and at the present rate will reach 1,000 ft. by October. The character of rock has recently been changing in the shaft, the material containing much iron, which is considered to indicate the proximity of an orebody. It is the opinion of many mining men that this portion of the Butte district will develop some good copper mines. The Boston & Montana Co. is opening the Glendale in the same locality. —— The Butte & Michigan Co. has installed a new hoisting-engine on its property southeast of Butte, and sinking will be resumed in a few days. The shaft is 100 ft. deep and will be sunk to 500 ft. —— The Blue Vein Copper Mining Co., a Butte corporation, has purchased the Soon placer claim, the Valentine and Little Boulder, and a half interest in the Columbia quartz-lode claims, in Butte district. —— The directors of the East Butte Copper Mining Co. have elected Frank M. Sullivan president, James A. Talbot vice president, Henry Mueller secretary and treasurer, Patrick Wall general manager, and Chas. R. Leonard counsel. The new plant of the company will be ready for operation within a week. It includes a 16-drill compressor and hoist. The second working shaft, being sunk a quarter of a mile south

of No. 1, has reached a depth of 200 ft., and is the biggest shaft in the district, having four compartments. This shaft will be equipped with a modern head-frame, and the shafts will be connected at every 200-ft. depth. The lessees are taking rich ore from workings above the 200-ft. level, the gross returns amounting to $2,000 per day, from which the company receives 25% in royalties, which has been sufficient to pay for all improvements, developments and new equipment. The heaviest expense of the company is now at an end, and the expectation is that it will pay dividends soon. Negotiations are also pending for the acquisition of additional property, and a large precipitating plant is being built to treat the tailing from the old Parrot works, which cover a portion of the East Butte Co.'s ground.

F. Augustus Heinze, of the United Copper Co., has purchased a group of low-grade gold mining claims at Rimini, in Lewis and Clark county, and will establish there a big cyaniding plant. He has also bought several large tracts of adjoining ranch-land to be used in connection with his operations. Mr. Heinze is largely increasing his mining interests, having recently purchased properties in Alaska, California, Nevada, and interests in properties in Utah. In the Butte district, however, he is not doing much since the sale of his principal properties to the Butte Coalition Company.

The Great Northern Railway Co. has organized the South Butte Mining Co. to take in all the mineral rights owned by the Hill road in Silver Bow county, mostly included within its rights of way. The South Butte Co. is capitalized for $50,000, and the incorporators are John G. Williams, M. S. Riley and Arthur Howell, of Duluth, and all connected with the Great Northern railway. It is not the intention of the company to do mining, but it is likely that it will lease the mineral rights to others, or sell them outright. Some rich copper deposits have been found under the railway property. —— The Anaconda Co. has begun hoisting ore from the Pacific mine through the Buffalo shaft. —— The North Butte Co. is now hoisting 1,000 tons of ore daily.——The old smelter of the United Copper Co., which was acquired by the Butte Coalition Co., is being dismantled. It is understood that several offers were made to Butte Coalition to purchase or lease the plant by independent interests, but the offers were rejected. During the last year of operations by the United Copper Co. the smelter turned out about 3,000,000 lb. copper per month. ——A report is current that the Butte Coalition Co. has been negotiating for the purchase or control of the Pittsburgh & Montana Co., but this is denied by the officials of the former.

CALUMET, July 21.

Two important explorations have been inaugurated by the Calumet & Hecla Mining Co. in the last few days. The recently organized Caldwell Copper Co., a subsidiary corporation of the Calumet & Hecla, has started a diamond-drill on its property between the Tecumseh and Rhode Island, where the Kearsarge amygdaloid lode will be explored. The other is northeast of the Mohawk mine, in Keweenaw, where a tract of 240 acres has been acquired, and two shafts started. In this vicinity the Kearsarge amygdaloid bed outcrops for nearly a mile, and a good operating depth can be reached on most of the property. The Calumet & Hecla's new scene of activity is north of the Mohawk's No. 1 shaft, where the latter has been finding its richest ore lately. As the Calumet & Hecla property adjoins the Seneca, which is regarded by some as a promising undeveloped property, the work of exploring the Calumet & Hecla land will help to prove the Seneca.——Construction work on the new engine-house for No. 4 shaft of the Wolverine mine is progressing rapidly. It is built of stone, with a steel roof. The new hoisting engine, to be delivered shortly, will be capable of operating two skips to a depth of 4,400 ft., the limit on the lode in the Wolverine's territory. Now that No. 3 shaft is being used again, it will be called upon to do one-half of the work ordinarily required of No. 4, as considerable repairing will be done in the latter.

Some speculation is being indulged in regarding the properties which the Quincy Mining Co. expects to purchase, a special meeting of the stockholders to ratify the doubling of the capitalization for this purpose having been called. One report is that the Quincy plans to absorb the Rhode Island, which is closely related to it in its Eastern management; another is to the effect that the land owned by the Arcadian, north of, and adjoining, the Quincy's No. 8 shaft, will be purchased. The acquisition of this land would undoubtedly be of great value to the Quincy; still another report is that it is planned to consolidate with the Hancock Consolidated, but none of these rumors bears the stamp of authenticity. ——Sinking in the shaft of the Lake Copper Co. has reached a depth of 500 ft. on the Knowlton amygdaloid belt, where excellent copper ore is being taken out. Diamond-drill exploration continues. It is the plan of the management to obtain a complete cross-section of the entire property. Several lodes have been intersected by the diamond-drill holes, at least one of which is copper bearing.

Work of re-opening the Atlantic shafts is being pushed, as it is desired to resume production as soon as it can be accomplished. In B shaft three crews of men, working eight-hour shifts, are repairing the damage caused by the settling of the hanging wall. There is little damage to the fifteenth level, and further investigation may reveal that below that point the damage has been overestimated. The skip has been operated to the fifth level, the shaft being in first-class condition to that point. It appears that D shaft suffered most from the air-blast. At the third level the passage is blocked, and the drift north of that point shows settled ground for 200 ft. As soon as men can be obtained D shaft will be repaired.

It has been decided by the Allouez management to start another shaft 1,620 ft. north of No. 1 to open the Kearsarge amygdaloid lode. A depth of 90 ft. was reached in the present No. 2 shaft. From the bottom a pipe was driven down 80 ft. through quicksand and water before striking rock, and it is uncertain whether it is the vein at that depth (170 ft.) or one of the large boulders such as have retarded the progress of the shaft. The site selected for No. 2 shaft is 600 ft. nearer No. 1. It will require greater depth to reach the lode, but it will be possible to make connection with No. 1 shaft a year sooner. The Allouez's No. 1 shaft is down 100 ft. below the sixth level. It has been decided to increase the distance between levels from 100 to 125 feet.

DENVER, July 23.

Several weeks ago I mentioned that the heavy snows in the San Juan would probably prove a blessing in disguise, because the spring snowslides would probably uncover some new orebodies, many of the big mines of the district having been found in the freshly plowed path of the avalanche. My prophecy has been most exactly fulfilled by the remarkable discoveries in Poughkeepsie gulch. This gulch or canyon comes into Uncompahgre canyon, about ten miles above Ouray. The precipitous nature of the Uncompahgre canyon is more than continued in Poughkeepsie gulch, and in one place the wagon-road is fastened to the face of the cliff by brackets. The upper part of the gulch consists of an open basin and here there is a pretty lake or two. Just below the open basin, a snowslide cleaned off the surface of one of the giant veins of that country and showed the polished apex of an 8-in. streak of stuff that fairly glistens with free gold. It has since been traced half a mile; the vein, of course, has been known for years and is one of the strong veins of the San Juan region, extending for a known length of upward of three miles. Other discoveries have followed and the width of the ore has been found to be 10 or 15 ft. in places. The 8-in. streak is only the high-grade streak; there is lower grade stuff accompanying it.

Poughkeepsie gulch was mined for silver prior to the panic of 1893 and some of the most picturesque mines in the world are situated on its precipitous sides. I recall one whose tunnel-house is perched on an artificial bench about 300 ft. up the side of a vertical cliff. The cliff extends upward some more hundreds of feet and in order to get a draft for the boilers the smoke-stacks are run up the side of the cliff at least 100 ft. To sample the dump of this mine, one would have to take one's lunch along, for it is a long trip from the mouth of the tunnel to the dump and back.

I don't know how good the old silver mines of Poughkeepsie gulch were, but there was a lot of work done there.

There are two sections of that great mineralized range called the San Juan, which have not been heavy producers heretofore. One was the Poughkeepsie Gulch section and the other is that part which lies above Pagosa Springs. I have heard many reports of discoveries from the latter section lately and it may be no great time till practically every part of the San Juan range will be producing ore.

CRIPPLE CREEK, July 23.

Thirty cars of ore, having an average value of $40 per ton, have already been shipped from the Knight & Co. lease on the Little Clara claim of the Work property on Raven hill. This ore is being obtained from a stope more than 80 ft. wide, which is being operated through the Ophelia tunnel at a distance of 2,000 ft. from the mouth. A large ore-house has just been erected, which, together with the one already on the property, will facilitate the handling of a much larger tonnage. On block No. 4 of the Morning Glory claim of the above property, Hodges & Talbot, lessees, made their first shipment on July 16 from their new strike on the 150-ft. level. The vein is four feet wide and is expected to give returns of two to three ounces when shipped.

Several of the mines of the district have suffered from the severe rain-storms which have occurred for the last three weeks. The Henry Adney mine on Beacon hill is shut down temporarily owing to the drowning out of the boilers and engine by the flood of Saturday, the 14th. The production of this mine will be in the neighborhood of 250 tons for July if nothing unforeseen happens; the grade of the ore is about two ounces.

The Golden Cycle Mining Co. is said to have acquired 10,000 acres of coal-land east of the city of Colorado Springs, so as to be able to control its own coal supply. A large proportion of the output from this acreage will be used at the Telluride mill at Colorado City, which is being remodeled to handle the Golden Cycle ore.

Several prominent Cripple Creek operators have gone to inspect the new Spaulding district at Ilse, Custer county, which has come into such prominence during the last two weeks. Ilse is situated 25 miles due south of Canon City, being reached from that place by wagon road. The veins, which are in granite, can be followed for a mile or more, and assays ranging from a trace to several ounces in gold per ton have been obtained from prospects, very few of which are over 20 ft. deep at present. Copper and lead have also been found in the veins, but whether in paying quantities or not is yet to be determined.

On the Pharmacist, situated on the east slope of Bull hill, Maxwell, Neville and Carpenter, operating through the Robinson shaft of the Acacia Co., are shipping ore which is giving returns of two ounces in gold per ton. This ore is being obtained at a depth of 180 ft. and is being raised on, at the same time increasing slightly in value, and with no sign of playing out.——The Isabella Gold Mining Co., on Bull hill, has commenced excavating below the big dumps of the Lee shaft for a cyanide-plant that it is proposed to erect. Six 100-ton vats will be installed at first, but the plant will be so arranged as to permit the addition of more vats if necessary. George D. Kilbourne is manager for this company, which will be the first in the district to break away from the mill trust.

The new Henley vein on the Elkton Consolidated Company's property, on Raven hill, has turned out to be a big thing. It is now opened up on the 4th, 5th, 6th, and 7th, levels, the vein being first discovered on the lowest mentioned level. The ore shipped has given returns of from 2 to 10 oz. gold per ton.——The Portland Gold Mining Co. has filed in the United States district court nine separate suits against Stratton's Independence, Ltd., and several of the lessees operating on the Stratton property, for wilful trespass and extraction of ore alleged to belong to the plaintiff company. The amounts mentioned in the suits aggregate about $360,000. One of the suits is against Stratton's Independence itself and is for $17,500, the remaining eight being against the lessees, in which the Stratton company is made party defendant. A vertical line was established by W. S. Stratton on the northern boundary of his property separating it from the Portland Co.'s ground, it being agreed between the two companies that ground south of the line should belong to the Independence and that to the north of the line should belong to the Portland. This was before Stratton sold the Independence to the Venture corporation of London.

The Western Investment Company is making another shipment from its recent strike on the Sacramento, of the Stratton Estate, on Bull hill. This ore is being obtained at a depth of 500 ft., from a vein which is believed to be a continuation of that which is being worked in the Specimen claim adjoining to the north. This same company is also shipping ore from the Orpha May, another of the Stratton Estate properties on Bull hill; stoping is being carried on at the 400-ft. level where the orebody is of good size and of fair grade.

Six inches of high-grade ore has been opened up by Pressler & Co., lessees on the Mary McKinney. Operations are being conducted through the Burch shaft; the seam is very spotty, but the ore broken is two feet wide and gives returns of five to six ounces when shipped.

SALT LAKE, July 21.

The ore and bullion settlements last week aggregated a total of $513,500. In the Salt Lake Stock & Mining Exchange for the same period there were transfers of 190,927 shares for $157,035. —— The Utah Consolidated Mining Co. is producing copper at the rate of 20,000,000 lb. annually, at a cost, after deducting the gold and silver content, of less than 5c. per lb., equivalent to an annual profit of $2,500,000. The company began the year, according to the last annual report, with about $1,500,000 in its treasury. Unless the directors increase the dividends, this would meet all requirements, making it unnecessary to draw on the current year's earnings. There is a possibility of the smelter being removed to another site, owing to litigation over damage from fumes. This is believed to be the reason why the directors did not increase the dividend. The smelter at Murray is handling about 900 tons of ore daily. —— The Utah Copper Co. will introduce steam-shovels at its Bingham mines within a week, as the Boston Consolidated has done; these machines will be used for the present in stripping the overburden. Connections have been made with the tracks of the Copper Belt railroad. —— The Utah Apex Mining Co., operating at Bingham, has placed $100,000 of the $500,000 worth of first mortgage bonds through a Boston brokerage firm. E. R. Hastings, president of the company, stated recently that this allotment would give the company sufficient funds to carry out its proposed plans of development and equipment. If a smelting plant is built later, however, the remainder may be offered.

The City Rocks Mining Co., at Alta (R. P. Edwards of Salt Lake, manager), is installing an aerial tramway to connect the mine with the tramway system of the Continental Alta Mines & Smelters Corporation over which ore will be transported five miles for 40c. per ton. It will then cost $2.25 per ton to get ore to the smelter.——The Interstate Mining & Milling Co. has been formed with $100,000 capital stock, to operate in the Silver Lake district, Utah county. G. B. Kelly, of Salt Lake, is president.——The smelter of the Glasgow & Western Exploration Co., situated at Golconda, Nevada, is to be overhauled and equipped with devices invented by Otto Stahlman, the general manager. Machinery has been ordered from Chicago. The headquarters of the company are in the McCornick block, Salt Lake.

Last week ore shipments from Tintic district, in Juab county, aggregated 105 carloads, the shippers and their contributions being; Centennial-Eureka, 6; Carisa, 4; Ajax, 3; Black Jack, 8; Beck Tunnel, 8; Grand Central, 6; Gemini, 5; Eureka Hill, 4; Eagle & Blue Bell, 7; Dragon Iron, 13; Uncle Sam, 2; Victoria, 3; Yankee Con., 4; Scranton, 4; Ridge & Valley, 3; Mammoth, 9; May Day, 2; other mines, 2.——The directors of the Lower Mammoth Mining Co., at their next meeting, are expected to levy a five-cent assessment, and the shaft will probably be ordered sunk 300 ft. The mine is in debt about $19,000.——Work is progressing on the new compressor plant of the Yankee Consolidated Mining Co., at Homansville, which will replace the one destroyed by fire.——Another 12-ft. body of lead ore, of shipping grade, has been encountered in a raise in the Eldorado claim of the Scranton Mining Co.

Park City ore shipments this week aggregated 2,041 tons, the contributing mines and respective amounts being: Daly-Judge, 675; Silver King, 621; Daly-West, 495; Kearns-Keith, 56; Little Bell, 127; New York, 32; Moore Con., 21; Jupiter, 12.——The property of the Odin Mining Co. continues to improve with development, and shipments will probably soon commence.——The property of the Steamboat Mining Co. recently passed to the control of Jesse Knight, of Provo, Utah, who is working 15 men. The mine is being opened by adit. William Witt, of Heber City, Utah, is superintendent.——New York Bonanza shipments will be resumed next week and officers of the company say they believe the shareholders will not be called on for another assessment for some time.——At the Magnolia-St. Louis, pending the installation of pumps, the sinking of the shaft has been discontinued.

CANANEA, Mexico, July 24.

Details of the deal whereby the America mine has changed hands were made public last Saturday. Beside this mine the property of the Cananea-Duluth Mining Co. was also taken over. The purchase price of the America is announced as being $2,500,000 and that of the Cananea-Duluth $500,000. The basis upon which the sales were made is that one-third of the properties will be owned by Col. W. C. Greene, president of the Greene Consolidated Copper Co., and the balance owned by Thos. F. Cole and his associates. The America property was held under bond by Lewisohn Bros., of New York, and this bond expired last April. When Lewisohn Bros. endeavored to have the bond renewed, they found that it had been tied up by Col. Greene and his associates. These properties will be handled by a new company which will be known as the Cananea Central Mines Co. to be capitalized at $10,000,000. The entry into Mexican mining fields by the powerful interests that Cole and associates represent is looked upon as an event of great importance, as it means that the production of this camp will be greatly increased.

The Greene Gold-Silver Co. is installing dredges at its La Brisca property. These dredges are about 385 ft. long and each dredge carries its own amalgamating apparatus. The dirt that will be handled assays $2 per ton and the dredges have a capacity of between 2,000 and 2,500 tons per day. The Greene smelter at Guaymas will be completed in a very short time. Owing to increasing the size of the plant, it is necessary to erect another stack, and this is what is holding the plant back. Tne smelter will have a capacity of 500 tons per day.

The West Cananea Copper Co. was organized last week to develop a number of claims lying five miles west of Cananea. On the property there is a copper outcrop 600 ft. long and from 40 to 60 ft. wide, which gives assays from 2 to 4% copper anywhere on the surface. An adit has been driven into the hill, which has already cut the vein at about 45 ft. from the surface. The ore in the breast assays 20% copper and $6 in gold and silver per ton.

The Santa Beatriz Mining Co., controlled and owned by the Santa Beatriz syndicate of London, England, is doing a great deal of work on its property on Cocospera mountain, in the Magdalena district of Sonora. The mines are on the south side of a highly mineralized copper hill, and on the north side there is over 5,000 ft. of work done which is over 100 years old. Both the *antigua* and the present workings are in ore which assays over 45% copper on the average. It is one of the richest copper deposits in the State of Sonora, and with a little more work can be mined at a great profit. —— Ore assaying 26 oz. silver and 17% copper has been encountered in the breast of the adit being run on the property of the Cananea Eastern Mining Co., which is situated about 13 miles east of Cananea. This strike was not expected, as the main vein was not within 105 ft. of the end of the adit which was being run to cut it. From present indications it is expected that the strike will develop into an orebody of considerable size, and that when the main vein is cut the property will become a good producer. —— The installation of the new pump at the Campana shaft of the Sierra de Cobre mine has done away with all trouble from water. This mine, which is owned by the Copper Queen Co., is shipping 200 tons of 5% copper ore daily, to the Douglas smelters.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—At the Calumet & Arizona, one of the furnaces is now completed and should be in operation by the first of next week, when the output of that smelter will be increased 15%.——At the Copper Queen smelter the principal improvement is the addition to the steel smoke-stack, which will be made in one piece and placed in position by means of scaffolding. The first of the new furnaces at this smelter will be ready for operation in September.——In the Lake Superior & Pittsburg property two new orebodies have been found. At the shaft the foundation is being built for the new hoist, which will be a duplicate of that at the Junction. At the Hoatson shaft the pump-station has been completed on the 1,150 level, and the pump will be installed during the coming week. On this level driving is in progress with no increase in the flow of water, which is 100 gal. per min. Sinking will be resumed August 1.——At the Holbrook shaft of the Copper Queen there has been trouble this week caused by the settling of the ground. The shaft-timbers were squeezed so that they interfered with the work of hoisting. This is now being remedied.——At the Shattuck they are getting ready for shipping ore. The new tramway will probably be ready for use August 1. The new steel head-frame is now on the ground and will be erected early in August. The new hoist is expected to arrive next week. At the Denn-Arizona they are still driving toward the diamond-drill hole on the 1,000-ft. level, and at present are working in iron ore, which was encountered two weeks ago, 40 ft. of drift having failed to show the end of it. Sinking was resumed in the shaft Friday, and it is to be continued to 1,200 ft. The flow of water is 350 gal. per min. The new Prescott pumps will be installed in August.——At the Cochise, the shaft is down 600 ft.; most of the drifting being done on the 300 level. A new exhaust-fan has been installed on the 300. The new 150-h.p. boiler will probably be in use at the beginning of the week. Development now indicates that the main orebody is north instead of south of the shaft as was formerly thought.

Bisbee, July 21.

(Special Correspondence).—The Elwell Mining Co., operating the Exposed Reef mines in the Huachuca mountains near Palmerlee, contemplates crushing its ore dry to 20 mesh with rolls, concentrating on Wilfley tables and cyaniding the sand. G. R. Wellborn is superintendent.——A Montana company has taken over mines near Palmerlee and is building a road over which to haul a large compressor.

Palmerlee, July 21.

YAVAPAI COUNTY.

(Special Correspondence).—Active operations on the Rainbow Mining Co.'s properties in the Bradshaw mountains have been suspended during the absence of W. E. Paul, general manager in the East. Upon his return he intends to install a reduction plant at the mine. One of the veins is opened by an adit 344 ft. long, which connects with a 135-ft. shaft sunk on the vein from its apex. In the adit the ore is continuous, with a width of two to six feet, while the pay-streak in the shaft averages three feet in width. The ore in shaft and adit samples over $30 per ton gold, silver, and copper. Farther north, along the same vein, another adit has been run, in which the pay-streak is eight inches wide with the same general average value as in the other. It is thought that the ore of the higher levels has not yet been struck in the lower workings. The group consists of nine patented claims, which includes timber and water rights. The camp is two miles from Crown King, the present terminus of the Bradshaw mountain railroad.

Prescott, July 21.

It is reported at Prescott that the parties working the Copper Hill property, in Copper basin, have cross-cut 30 ft. of ore which carries $30 per ton in copper and gold.——It is reported at Congress that the Sayer mine, near that place, is to be re-opened. The vein is large and the ore free milling.——Sinking is to be resumed on the Coronado mine.

CALIFORNIA.

AMADOR COUNTY.

James Cosgrove recently found a good-sized diamond while panning a clean-up on his property, the Matt White gravel mine, near Volcano. A number of diamonds, all of them small, have been found in the ancient gravel channels at Volcano and at Rancheria, though no systematic search has ever been made for these gems.——A new pipe-line is being laid from the reservoir to the Kennedy mine, near Jackson, to supply the works with water. Permission has been given to connect a four-inch main for fire purposes.——The Bay State mine, four miles north of Plymouth, has resumed operations, under the management of stockholders and others. For 15 years development has been vigorously prosecuted except at short intervals. The property has had a varied career, at times looking well and producing good ore, but this condition was spasmodic, at best; it has now been determined to give it another trial.

CALAVERAS COUNTY.

It is reported that capitalists are negotiating for the purchase of the copper mines near Campo Seco—the Harmon, Borger and other claims—which are to be consolidated under one management.

DEL NORTE COUNTY.

(Special Correspondence).—Mining history is being made rapidly in the Del Norte district, and interest in mines and mining matters is becoming general. Those interested in mines are making an effort to develop them, and a feeling of confidence seems to prevail. Mr. Marlowe has a crew working on the Doctor Rock, a copper property, on the headwaters of the South Fork of Smith river, and Dr. Heintz, of Redding, is carrying on a like operation on Rogue river.——J. N. Britten has men working day and night driving an adit to cut the vein on the Hard Luck claim on Sheely creek, recently purchased from Mrs. E. Graham.——While prospecting on the Monumental property last week, G. F. Morgan and Louis Graham discovered a 30-ft. vein of ore similar to that found on the 40-ft. level of the main shaft. The vein is exposed for 600 ft. standing as high as 40 ft. above the surrounding country.

Crescent City, July 23.

EL DORADO COUNTY.

(Special Correspondence).—At the Sherman mine, near Placerville, where 12 men are employed prospecting, they have struck good ore in the 300-ft. level.——At the River Hill mine, near Placerville, the main shaft is 1,300 ft. deep. The vein is 30 ft. wide, about 20 ft. being good milling ore, the greater part of which is coming from stopes above the 1,150. A 20-stamp mill, run by water-power, is on the property. The water, with a fall of 220 ft. at the mill, develops 35 h.p. whence it is piped to the lower compressor where, under 600-ft. head, it develops 150 h.p., furnishing compressed air to run drills and to operate the entire plant. The shaft will be sunk 500 ft. deeper. Fifty-five men are employed. Thos. Clark is general manager and G. M. Clark is superintendent.

A body of rich ore is reported discovered on the 1,000-ft. level of the Mt. Pleasant mine at Grizzly Flat. This mine has produced some rich gold ore in the past, and a great deal that is low grade. It had been idle for some time until recently.

SAN BERNARDINO COUNTY.

Charles M. Schwab, B. Gillies, H. Ramsey, C. E. Knox and J. Salsberry are reported to have bought 17 claims from Arthur Kunz at the Greenwater copper camp 50 miles southwest of Rhyolite. Ore running 40% copper is piled on the dump awaiting the coming of the 'Borax Smith' railroad, which will pass 12 miles from the camp.

The Arizona-Mexican Mining & Smelting Co. has completed the purchase of 3,000 tons of lead ore from the Humboldt smelter, near Mayer, Ariz., which had been buying lead ore for several months but found itself entirely occupied with copper ore, and sold its accumulation of lead ore to the smelter at Needles. The shipments will continue at the rate of two or three cars per day until the entire amount has been received. The Needles smelter is now the only lead market between El Paso, Texas, and San Francisco. The roasters were started last week and are working steadily now, treating 40 tons per day.——W. H. Smith, of Vanderbilt, has bonded the Desert Queen group, belonging to Green, French and Wallace, and situated eight miles northeast of Blackburn siding, on the Santa Fe, south of Manvel. On these claims is a porphyry dike 130 ft. wide, in which are quartz stringers assaying, it is said, from $400 to $500 per ton. The porphyry and talc between the seams prospect in free gold; there is also silver and lead.——The Raven Co. has paid $15,000 to W. L. Williams for his property. The same company has also bought property from T. Cunningham, for which it paid $8,000; Hanson brothers have purchased the Amargosa mines for $120,000; and Chisholm & Co., of Los Angeles, are negotiating a deal with Boston parties for the purchase of the Riggs silver mine, known as the Alta group.——William Wheaton has discovered gold in San Antonio canyon, seven miles from Upland. For years Wheaton has been prospecting in the San Gabriel mountains, but up to a week ago accomplished little in the way of discoveries. He now is reported to have discovered, at Spring hill, ore which assays from $150 to $300 per ton. The firm operating the mine is known as the Wheaton-Morgan Mining Co., with William Wheaton and John Morgan as chief owners. At present the ore is being packed to the trail on burros and thence by wagon to the railroad.

SHASTA COUNTY.

It is reported that the Friday-Lowdon group of copper mines near Kennett has been bonded by the Mammoth Copper Co. for 18 months, in the sum of $200,000. The mines are owned by J. R. Lowdon, of Redding, W. Friday, of Kennett, and T. Hart Benton, of Shingletown. Mr. Lowdon and Mr. Friday have owned the group for 12 years and have spent $25,000 in development.——The Mountain Copper Co. has miners in the Hornet taking out a run of 200 tons of ore. The Hornet is about two miles from the Iron Mountain mine. It contains a larger body of ore than the Iron Mountain, but it is of lower grade and of a different character. The Mountain Copper Co. has long contemplated working ore from the Hornet, and the results obtained from this test will largely determine future operations.——At the Bullychoop mine, on Bullychoop mountain, 200 men are employed and the 10-stamp mill is in operation. The roads that have been building for several months are nearly completed, and when finished the machinery for an electric power plant, on Indian Creek, will be hauled in. It will furnish power to run a large compressor to be installed at adit No. 3. An aerial tramway will connect the mill and mine. A 30-stamp mill is also to be built.

SISKIYOU COUNTY.

Four men are stoping and sinking in the Highland mine, situated in the western part of the county, and owned by J. Tetherow.——Hathaway brothers and Munger have a camp at Cold Spring and are prospecting in that vicinity.——A Los Angeles company has made a second payment on the Hardscrabble group to R. Pitcher and J. Bingamen.——Burton & De Nure, of Quartz valley, are stoping and their new mill is running. The placer mines owned by Wright & Fletcher, and the Eastlick mines, are still operating their giants and elevators at Oro Fino. They have an abundance of water and it looks as if they would have plenty to run them until August 1.——The wire and poles for the new electric power line of the Morrison mine, at Quartz valley, have been placed in position, and connection will soon be made with the Siskiyou Power Co.'s line. It is the intention to sink on the ore about 200 ft. Huey and sons' mine, joining the Classic Hill, has reached pay-ore. Mr. Huey had his left leg broken by a piece of falling roof while taking out a pocket of gold.——One hundred and thirty mining locations were filed in the county recorder's office in June. The big increase is largely accounted for by the copper excitement in several districts.

TUOLUMNE COUNTY.

The Harvard Mining Co. now employs 45 men at its mine on Whiskey hill, near Jamestown.——At the Granite Hill Mining Co.'s property, the Densmore mine, near the Stanislaus river two miles north of Columbia, 22 men are employed. A. J. Crowell, the manager, says that when the

air compressor arrives at the mine, machine-drills will be put in. The 10-stamp mill is running steadily.——A steam-hoist is being set up at the Imperial group of mines, below the Shawmut, near Chinese. Sinking will be resumed.—— C. A. Fitzgerald, William McGinn and A. F. Davis have bonded to J. G. Davies and R. A. McWilliams the Patterson mine and mill-site and the Lennan mine, situated near Tuttletown. The conditions of the bond give Davies and McWilliams three and one-half years in which to make payments aggregating $30,000, the deed to remain in escrow. They are to make the first payment of $10,000 on December 6, 1907. Work must be commenced within 30 days and continue with at least four men during the life of the agreement. The crushing of rock must begin within a year and 25% of the gross proceeds be given the owners.

(Special Correspondence).—Either the demand for miners is much greater or the number available is less at present than usual, as few of those willing to work are out of employment. Until recently employers have experienced little difficulty in securing all the underground laborers desired. The most important of the recent transactions in this county is the sale of the Dead Horse mine and the Lady Washington property at Carters, which were deeded to C. Y. De Lay, by the Eureka Con. Gold Mining Co., of which E. J. McCutcheon is president. According to reports the Grizzly, New Albany, Dead Horse and Lady Washington will be consolidated.——Colorado people have been examining the Bourbon mine, near Tuolumne. Development shows a large vein of good ore. Ten men are employed.——The New Lead mine, situated near Phœnix lake, three miles east of Sonora, has been bonded to L. K. Brown, of Los Angeles, and Truman Sherick, of Salt Lake City.——The force at the Eagle-Shawmut, near Jacksonville, has been increased. Operations are to be resumed at the Atlas mine on Jackass hill, near Tuttletown. The mine is being unwatered.

Tuolumne, July 17.

(Special Correspondence).—The supply of water for mining purposes will last considerably longer this season than usual, adding materially to the prosperity of the county. The rivers are higher now than they have been at this time of year for twenty years, and it is probable that the mines depending on water for power will not be forced into idleness.——The Standard Gold Mining Co., developing several claims in the Buchanan district, expects to soon have its mill ready for crushing ore from the Paymaster. An air compressor and rock-crusher are now being installed. —— Two hundred men are employed at the Eagle-Shawmut at Jacksonville, and the mill and chlorination works are in operation night and day. —— The pay-roll of the Grizzly has been increased. The Paymaster and Hardtack mines are also working with augmented forces. —— In running an raise from the 500-ft. level in the Spring Gulch mine ore of unusual richness was found this week. The vein is four feet wide and the rock is thickly speckled with gold. The shoot is 100 ft. long and no stoping has been done between the 500 and the 400 levels. The mill is running steadily and nine men are employed. —— Wm. Sharwood has agreed to sell a mine near Soulsbyville to the Bagdad-Chase Mining Co., which is operating the Soulsby.

Tuolumne, July 24.

COLORADO.

BOULDER COUNTY.

(Special Correspondence.)—Walter & Row are installing a hoisting plant on the Golden Queen, and are ready to cut ore. The shaft is down 85 ft. There is gold and copper in the ore, some of which they shipped while sinking the shaft.——The stockholders of the Myrtle Mining Co., operating the San Blas, will meet here in a few days, when they will decide whether the mill is to be rebuilt. It had just been put in shape to operate when it was burned. A. T. Rautenberg is manager.——George M. Mitchell, manager of the Ward-Struggler Gold Mining Co., is driving a cross-cut at the 500-ft. level. The main Struggler vein was cut at 130 ft. after starting the cross-cut. The mill on the property is idle. The ore is complex, and it will probably be necessary to make some changes in the mill to effect a close saving. Frank W. Smith is superintendent.——W. F. De Camp, of Denver, is operating the Humboldt mine and treating 30 tons per day in the 15-stamp mill, besides shipping ore. G. A. Kline is superintendent.——A good strike has been made in the Sullivan mine under lease to Nichols, Jones and Zoller. The ore carries gold, silver and copper. They expect to ship a car per week. Machine-drills are being considered. The vein is six feet wide.——The Upper Utica, under the management of John McInery, is making regular shipments to the Quiglyville mill.

Ward, July 19.

(Special Correspondence).—B. K. Stambaugh, superintendent of the Parallel, is sinking and driving. The shaft is down 118 ft.——Several lessees are at work on the St. Joe, taking out a good grade of ore. C. F. Cross is in charge.—— The Pollock Mining & Milling Co. installed a concentrating mill last year, but, owing to scarcity of water, it has been unable to run regularly. Many radical changes were made in the mill from the original construction. There are 5,000 ft. of workings on the vein. The two adits are each 900 ft. long. Report says 30,000 tons of ore are blocked out in the mine which will average $10 to $12 per ton. It is sulphide of lead, iron and zinc. The mill treats 40 tons per day, concentrating six tons into one, the concentrate averaging $50 per ton. The ore passes over a grizzly at the mine, where the shipping ore is taken out by hand and the mill dirt sent to mill by a gravity tramway. The plant is 1½ miles from a railroad. L. A. Newell is manager, and R. P. Apollonic superintendent.——Merrick & Straub are starting an adit to tap the Commonwealth, Cashier and other veins on Big Horn mountain near Summerville. They are also installing a compressor.

Salina, July 19.

CLEAR CREEK COUNTY.

The Democrat Mountain Mining Co., operating near Georgetown, has decided upon the erection of a concentrating mill at its Moline mine with a capacity of 50 tons per day. The mill will be on the same plan as that at the Mendota. An aerial tramway is to be erected 2,000 ft. long, from the Moline adit to the mill, which will be built near the mouth of the Kelly adit. A 2½-inch pipe-line has been laid from the power-house to the Moline to convey compressed air for machine-drills which will be put in a raise.

DENVER COUNTY.

A new smelter, planned principally for handling ore carrying zinc, which is rejected by many smelters in the State, will begin business August 1 in Denver.——The Wallace Ore Reduction & Sampling Co., organized a few days ago, has purchased the Hitchcock woolen mills in South Denver, and will install machinery for handling ore, and by August 1 will be ready for business. It is the plan of the incorporators to handle but 25 tons of ore daily at the start, and they have already contracted for ore far ahead of their capacity. When the new sampler was first planned offers were made from mine-owners all over the State to supply the smelter with a great quantity of ore, ten times the capacity being offered, even before the incorporation was announced. Enough ore has been contracted to insure the success of the enterprise. Contracts for ore from Breckenridge, Leadville, and other camps, where much of the ore carries a large quantity of zinc, have been signed.

LAKE COUNTY.

Emil Ludwig has resumed work in the By-by group in the Red Mountain district.——The Mammoth mine in Lincoln gulch, near Twin Lakes, is again in operation.——The Ruby Mines Co. is getting out shipping ore. At the Doctor mine, near Twin Lakes, gray copper carrying wire silver is being mined.

SUMMIT COUNTY.

(Special Correspondence).—The mining outlook at Breckenridge is unusually good. The district generally, and Breckenridge in particular, has not looked so well for ten years. The resuscitation of old properties, now being worked for zinc, and the introduction of scientific methods in handling low-grade ore, are bringing Summit county to a position it should have occupied long ago.——The Wellington mine management is outlining a program of extensive development and the installation of new machinery.——The Wire Patch mill is near completion and will be in operation by August 1.——The Old Union Co. has resumed milling

after installing new screens. This company ships 10 carloads of high-grade concentrate per week.——The Atlantic Mining Co., owning extensive property on North Star mountain, has completed a series of tests in ore treatment. The company leased the stamp-mill in Montgomery camp at the foot of Hoosier pass, put the mill in order and several runs were made under the supervision of Frank Lawrence. The runs were satisfactory, and the company has decided to build a mill of its own and put in an aerial tramway. This company has a group of 37 claims, and some of the ore runs 15 oz. gold per ton. The ore is talcose, and shipments to smelters contain 20 to 30% moisture. It is expected that by milling, and perhaps cyanidation of tailing, the excessive charges will be eliminated.——The Puzzle mine is to be operated under new management. James F. Calbreath has made a consolidation of the Puzzle and the Gold Dust mines, and is arranging to work the properties jointly. Electric power will be installed and the Puzzle workings unwatered. The Puzzle contains high-grade silver-lead ore and also an immense tonnage of concentrating ore.——H. T. Koltie, of Joliet, Illinois, president of the Washington Joliet Mining & Milling Co., is in Breckenridge inspecting the company's interests.——The Truax-Tecumseh claims on Mineral mill, above French gulch, have been leased to local operators. The old workings will be cleaned out, and the large zinc-bearing veins will be opened up. This property was abandoned years ago on account of the high zinc content of the ore.——The Wellington, Country Boy, Old Union, Morning Star, Lucky, Minnie, Bullion King, Gold Dust, Pennsylvania and Liberty are all shipping regularly.

Breckenridge, July 21.

SAN MIGUEL COUNTY.

(Special Correspondence).—The Japan-Flora Mines & Tunnel Co., of Denver—owning the Japan, Flora, Mikado, Ajax and Valley View mines, at Smuggler—resumed work last month. F. C. Bowman is superintendent. The old Japan concentrating mill, situated at the upper workings of the property, is being repaired to treat 25,000 tons of ore blocked out above the mill-level. The development of the lower workings of the Japan and Flora veins will be continued through the new 2,700-ft. cross-cut adit, and development of the Ajax group, which is the southeast extension of the Smuggler-Union vein, will also be pushed—Temple-Ingersoll electric air-drills having been installed for that purpose. The company has purchased a five-acre mill-site on the railroad at Pandora, adjoining the Smuggler-Union mill, where eventually will be erected a large concentrating plant, when the orebodies in the various groups are sufficiently developed. At present 100,000 tons of ore are blocked out. This property recently changed hands. It was formerly controlled by T. Walter Beam, A. J. Clark and David Swickhimer, of Denver, who sold their holdings at a valuation of $600,000 for the entire property. The present directors of the property are: J. J. Fisher, Pittsburg, Pa., president; A. G. Brownlee, Idaho Springs, vice president and manager; J. P. H. Cunningham, Newcastle, Pa., treasurer; Chas. H. Johnson, Newcastle, Pa.; and Wm. H. Shinn, Carnegie, Pa. Wm. E. Humphreys, of Denver, is secretary of the company.

Smuggler, July 21.

IDAHO.

BLAINE COUNTY.

The second-class ore accumulated at the Idaho Democrat mines of the Della Mountain Mining Co. the past year, at Hailey, is being concentrated by hand-jigging.——The concentrator for the Dollarhide mill has arrived and milling will be resumed in a few days.

SHOSHONE COUNTY.

A strike is reported in the Black Horse mine, near Murray, owned by the Idaho-Montana Summit Co. In the west drift on the lower level, two feet of clean galena has been opened. The property is under bond to the Federal Co.——Jerome Day has bonded the Pilot mine, where a rich gold strike was made recently.——The Idaho-Montana Co., which made a strike on its property late last fall, has just started work for the season. The group consists of 10 claims on the Idaho-Montana divide, five miles above Burke on the Glidden road. The discovery made last fall consisted of 18 in. of galena on the surface. An eight-foot shaft, since sunk on the showing, has opened three and one-half feet of quartz and galena, the latter occurring in streaks two to four inches in width. All of the quartz is impregnated with galena. The presidency of the company will be taken by R. H. Pascoe, superintendent of the Standard-Mammoth mines of the Federal Co., on his return from Europe.

MONTANA.

JEFFERSON COUNTY.

Clarence Rae has made a bond and lease of the Iron Parrott and Little Kid, belonging to Warren Snodgrass, and a steam-hoist will be put in. He has also disposed of the Copper King and New Albany in the Amazon district. A boiler and hoist will be put in and a shaft will be sunk 200 ft. Ore on the Little Kid assays $100 per ton and will be shipped, as it pays from the grass roots.——The Michigan-Montana Mining Co., operating the Blue Bird mine, near Wickes, is now encountering rich veins in the 1,800-ft. adit, and the superintendent will drive 400 ft. more to tap the main ore-shoot in the old shaft. Several companies are now mining in the Wickes district.——Mr. Bird, of the Beavertown section, is exploring his claim with a diamond-drill and has crossed one of the several veins. He is working 15 men on three shifts.——The Scotia is now making regular shipments of eight tons per day to Bingham, Utah. The vein is two to three feet wide and the ore assays $45 to $110 per ton gold and silver, with an excellent showing of copper and lead. Dever & Ackley have a bond and lease on this property from Dan McNeill.

SILVER BOW COUNTY.

The mills of the Montana Zinc Co., at Butte, were destroyed by fire on July 20. The plant was in the old silver mill of the Alice Mining Co., the oldest mill of the kind in the State.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—A few facts concerning this camp may be of interest. Searchlight has 1,500 inhabitants; 700 men are employed in the mines; the altitude is 3,800 ft.; the climate permits outside work the year round; there is a cheap and abundant water supply; a good ice plant, excellent hotels; an electric light and power plant is being completed; a railroad is now within a few miles of the camp and coming nearer every day. There are over 40 active mines, of which the following are equipped with stamp-mills: Quartette Mining Co., 20 stamps (adding 20), Cyrus Noble Mining Co., Duplex Mining Co., Searchlight Mining & Milling Co., Southern Nevada Mining Co., New Era Mining Co., Black Hawk Mining Co. and Techaticup Mining Co., each 10 stamps and Chiquita Con. Mining Co., five stamps. 'Wildcatting' is not successful in this district, as it requires a great deal of money to reach the large bodies of pay ore; in fact, it is generally necessary here, to go to water-level—200 to 300 ft.—at an expense of at least $10 per foot, which would exhaust the treasury of a cheap concern two or three times over. Success has, however, thus far been the reward of every property that has reached that depth.—M. L. Tobin, superintendent of the Chiquita Con. Mining Co., reports activity in the Juniper section of this district. Although there is a mill with cyaniding plant at the Blackbird mine, of this company, the ore is being shipped to the Needles smelter to minimize the loss in treatment. The shaft is 85 ft. deep and drifts have been started. The vein averages 18 in. wide. The whim is to be replaced by a 50-h.p. hoist.——A new company has been incorporated at Nob Hill, under the name of the Eldorado Sphinx, to take over the property of an old mine worked and deserted 40 years ago. The workings consist of an adit 160 ft., a winze 40 ft., and a raise to the surface from the adit. The ore, iron sulphide, carries $20 gold per ton, some of it containing 15% galena which assays 480 oz. silver. A 20-h.p. hoist has been ordered.——The Barnwell & Searchlight Railroad has established a shipping station nine miles this side of Barnwell and 12 miles from Searchlight. The hardest part of the grading has been accomplished, and as the level plain between the nine-mile point and this camp offers practically no obstacles to construction, the ticket-stamp will soon be working in Searchlight.

Searchlight, July 21.

NYE COUNTY.

(Special Correspondence).—The Manhattan Dexter Mining Co. has in contemplation the erection of a stamp-mill, but has held back awaiting the development of water, which is to be piped from East Manhattan. It does not have to wait longer, for at the bottom of the shaft on Lease No. 14 of its Union No. 9 claim, water in abundance has been encountered. The lessees have been blocking out the ore, and a short time ago at 190 ft. struck a large flow of water, and it is believed enough can be obtained to supply the mill continuously.——The Raycraft lease on the Little Gray, it is claimed, has enough ore blocked out to keep a 20-stamp mill running two years. The largest vein is 8 to 12 ft. wide.—— A stringer of rich ore was reported cut in the Mustang Extension a few days ago, and free-gold specimens have been taken out. This vein is about one foot wide.—The adit on the Gregory group of the Manhattan Nevada Gold Mines Co., at Central, is now in 95 ft. A vein 10 ft. wide has been cut and the ore assays $10 to $12 per ton gold. —The adit will be continued through the hill to intersect all veins traversing the company's holdings.——Gold ore is reported found on the Monday claim of the Original Manhattan Mines Co., situated half a mile north of Central. The ore is being sacked, and a shipment will be made within a few days. The vein is three feet wide.——The Manhattan Butler Mining Co. has recently been incorporated and is now developing its claims at North Manhattan, five miles from Manhattan. Two adits are being driven and good ore is being found.——An eight-foot vein has been uncovered on the St. George claim of the Manhattan-Whale Mining Co., this being the third property that has uncovered this large vein of sulphide ore which trends east-west through Gold Hill. The Bullhead claim of the Manhattan Gold Crater Mining Co. encountered it at a depth of 75 ft. and the Cowboy Mining Co. at 60 ft. These properties are blocking out ore and hunting for a rich pay-shoot in the large vein.——The hoist for the April Fool claim of the Seyler-Humphrey Gold Mining Co. has arrived and is in place. Adjoining this is the property of the Manhattan Standard Gold Mining Co., which is installing a gasoline hoist.——The Manhattan Consolidated, and Consolidated Extension, are working to their full capacity, blocking out ore. The Manhattan Mother Lode Mining Co. is about to let another 100-ft. contract in its adit.——At East Manhattan, the Manhattan Buffalo is installing a gasoline hoist at its 125-ft. shaft. The Manhattan-Mammoth and Consolidated Manhattan are rapidly opening up their ground by means of adits and developing the same orebody, which is the largest in the district.

Manhattan, July 21.

NEW MEXICO.

GRANT COUNTY.

About 50 men are building a wagon road from Lake valley to the Grand Central mine over the range, in Carpenter district.——A lead-silver strike is reported from Chloride flats, near Silver City. It was made at a depth of 60 ft. by F. A. Walter and W. J. Murray, who have a bond and lease on the Surprise. A shipment was made last week to the smelter. —— Two cars of high-grade zinc ore were shipped last week by the Empire Zinc Co. at Hanover to the plant of the Mineral Point Zinc Co. at Iola, Kan. William Swancoat, the superintendent, expects to increase the force at the mine. —— In view of its plans to increase operations, the Comanche Co. has appointed L. J. Carter superintendent of the mines at Leopold, and John Hodge has been appointed shift-boss. —— The Santa Rita Mining Co. is averaging a shipment of one car of high-grade ore daily. In addition, considerable prospecting is being done. Five shafts are being sunk to develop orebodies in different parts of the mine. Forty lessees are at work and the concentrating mill is running steadily. —— The experimental concentrator of the Hermosa Copper Co., near Hanover, is running satisfactorily. The plant was built by J. W. Bible and associates several years ago on the Hanover branch railroad, to be used for custom work. It has been much altered and is being used as a testing plant by the Hermosa Copper Co. —— Five hundred tons of iron ore per day are being shipped by the Colorado Fuel & Iron Co. from Fierro. This output is to be increased to 1,000 tons daily, and a few weeks ago a night shift was put to work, which has now increased the production to 800 tons. The company has acquired the Brockman iron mines in Hanover canyon.

TAOS COUNTY.

The American Metals Co. has installed three Wilfley tables and two vanners in its mill at the Modoc mine, in Organ district, and is turning out high-grade concentrate. ——At the Bennett mine, in the Organ mountains, a shoot of copper glance has been struck on the lower level, south drift. It is six feet wide. An assay across the vein gave 26% copper. The drift has been driven 16 ft. and is still in ore.——The Comanche Consolidated Copper Mining Co. has men under contract in the Cuchillos, near Edwards camp. It is the intention to sink to 700 ft. J. B. Taylor is in charge during the absence of H. B. Johnson.——Chicago capitalists closed a deal with Nicholas Galles, receiver for the Torpedo mine, for $325,000. Machinery will be put in to unwater the mine and develop it and a smelter will be erected. The Torpedo is a copper property.

OREGON.

BAKER COUNTY.

(Special Correspondence).—Forty miles northeast of Baker City, and 72 miles by wagon road, is situated the property of the Cornucopia Mines Co., of Oregon, consisting of 400 acres, mostly patented, and three mill-sites owned and operated by John E. Searles, of New York. It began producing in 1896 and has yielded $1,500,000 in gold. The equipment consists of a 20-stamp mill, power and mining plant. Electricity, generated by water power, is transmitted to motors—one 200 h.p. at the mill, one of 200 h.p. for driving air compressors, and one of 100 h.p. for the hoist. Machinery and buildings represent an outlay of $200,000. The development in shafts and adits will total 10,000 ft. An adit, 1,000 ft. long, reaches the workings. The veins are sharply defined and the ore is in part free-milling, from 10 to 60% of the assay value, in gold, being recovered on the plates. The veins average six feet in width and the filling of quartz and sulphides will average $20 per ton gold. The concentrate runs from $150 to $200 per ton. There are 100 men employed and the output approximates $40,000 per month. This property is at present undergoing many changes, which have given an impetus to mining in the surrounding country. Mr. Searles recently began to give personal attention to his Oregon interests, and made a tour of inspection of his Western mines. After spending a couple of weeks at Cornucopia he went to Eldorado county, Cal., where he owns the Union mine, an old producer, now operating 40 stamps. Returning to Oregon, he began the execution of plans outlined on his first visit. His engineer, John Hagel, and an assistant, are now preparing for the installation of 30 more stamps and the erection of miners' cottages. The intention is to abandon the boarding-house system and encourage the employment of men with families. Probably 300 men will be employed before the end of the year. There is said to be now blocked out, in this mine, ore sufficient to run 50 stamps continuously for two years. ——Chas. F. Soderling, manager of the Queen of the West Co., is developing a group of claims lying apove the Searles property. His pay-roll last month was $6,300. Soderling represents Minneapolis people. The company owns six claims, a mill-site and water power. A 10-stamp mill is nearing completion at the foot of the mountain, 3,000 ft. below the mine, to which a tramway a mile long is being built. The vein is six feet wide and the ore will average $20 per ton in gold. One thousand feet of work has been done on ore. A recent strike is reported here of ore said to average $100 per ton. The mill will be completed this fall.——George W. Boggs, manager, representing Spokane men, is working 20 men on another property on Cornucopia mountain. He is building a 10-stamp mill on Elk creek, including a cyanide plant. On the foothills of Eagle mountain, and lying between it and Baker City, two properties are working on the copper belt. The Indiana mine, J. W. Messner, manager, has reached a depth of 300 ft. and is driving on the vein. The breast of ore is 30 ft. wide and will average 8% copper and $4 per ton gold. D. W. C. Nelson, manager of the North American, at Burkemont, is down 350 ft., and the shaft at

the bottom is in sulphide ore with traces of copper glance. This shaft passed through 100 ft. of ore containing native copper, the ore dipping across it, before it reached the sulphide zone. These two properties have each a good working equipment and machine-drills are employed.——South of Baker City, and just over the line in Humboldt county, Nev., a recent strike was made by James Ellis, of Sumpter. James A. Howard, of Sumpter, sent Ellis into this district a month ago, on information which he considered worth the venture. Ellis reported the discovery of a mineralized region, 32 miles from Denio, Ore., and 10 miles from where Quinn river crosses the stage road running from Denio to Winnemucca, Nev. From the surface of an 18-ft. vein in this district, Ellis sent samples to Mr. Howard carrying $200 per ton gold, beside silver and copper. Howard was in Baker City recently, and with Thos. C. Burke and others sent an outfit on the road headed for the Nevada line. Since then other mining men who are not anchored here are rushing south to Denio.

Baker City, July 21.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Homestake Co. has started the electric motors in the Monroe mill (formerly the Caledonia) at Terraville, and the 100 stamps are now being operated by electric power. This is the first step of the Homestake in the utilization of the water-power of Whitewood creek. A large generating station has been completed at Englewood, and from that point the power is transmitted across the hills to the various places where it will be used. The Homestake Co. also intends to operate the Mineral Point (formerly Father De Smet) 100-stamp mill, at Central City, by the same power, and within a few days the motors will be started. The operation of these plants by electricity marks an important event in the history of the Homestake. The company proposes to operate these two mills continuously by electric power, and as fast as more electric energy is developed, will utilize it at other places on the property.——In order to gain depth on the vein and prospect it for 200 ft. along its course, the Iowa Co., at the head of Sheeptail gulch, near Central City, has started work on an adit. This adit is being driven toward a vein through porphyry, which is also gold bearing. There are several large veins on the property, all of which are to be explored. George V. Ayres, of Deadwood, is president of the company and O. N. Brown general manager.

PENNINGTON COUNTY.

The consolidation of the Holy Terror and Egyptain mines at Keystone is reported to have been accomplished at a recent meeting held at Southampton, Mass. W. F. Collins is manager.——The new 10-stamp mill at the Cumberland mine, near Hill City, is nearing completion, and F. C. Crocker, manager, expects to have it in operation in 30 days. The plant will contain 10 stamps, concentrators, and devices for close saving. The Cumberland property includes the J. R. mine, in which former owners lost the ore-shoot. The present management has been able to re-discover the pay-streak and develop it to such an extent as to justify the building of a mill.——Frank Hebert has recently started a two-stamp Tremain mill on ore from the Tin King mine, at Oreville, and is reported as producing a good grade of concentrate. The mill is equipped for fine crushing, and with a Wilfley table is making a fair saving. Mr. Hebert recently sold the Clara Bell mine.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Ben Hur Gold Mining Co. is to be re-organized. The mine has been closed down without paying off, but an early settlement is expected.——F. M. Gates, L. H. Mason and P. H. Walsh of Republic, have organized the Mountain Boy Mining Co. to operate a mine of that name at Park City, on the south half of the Colville reservation. This property has produced some rich ore.——On the Colorado mine, situated on the south half of the reservation, a vein of silver-lead ore has been opened by an adit. The ore is two and one-half to five feet wide and assays from 50 to 75% lead and 30 to 235 oz. silver per ton.——The Winnipeg Mining Co. reports that ore has been encountered in the Hawkeye adit on its property.——The Oversight Co. has struck shipping ore between the West Side adit and the Great Northern shaft. The ore will be shipped when the Belcher Mountain railroad can transport it to the smelters.——The upper tunnel on the Anonymous has crossed the vein 60 ft., of which over 30 ft. is oxidized ore and iron sulphide of good value. The lower tunnel is in 300 ft. The company proposes to start another tunnel which will run 1,000 ft. to the vein at 600 ft. depth.

The Red Metal Smelting Co. has been incorporated to establish a smelter at West Fork, on the Sans Poil river, 15 miles south of Republic.——The Mineral Hill Mining & Tunnel Co., operating near Danville, in the northern part of this county, has received a compressor. This company has a large group of gold-copper-bearing veins. On the Minnehaha, one of the claims, a shaft was sunk 150 ft., to a flat fault. An adit was run 275 ft. and then discontinued. Lately another was started which is expected to tap the old workings on the 150-ft. level. It is here the compressor is to be operated. Several carloads of $20 ore were shipped from the old workings to the Granby smelter, at Grand Forks, B. C. A second shaft, the Hercules, is 200 ft. deep and $90 ore was shipped from it. It is intended to connect the new adit with this vein by cross-cutting.——The Washington & Great Northern and the Spokane & British Columbia Railway Co. are cutting rights of way down the Sans Poil valley to the Columbia river. These roads will facilitate the development of a wide scope of country and a large number of good mining prospects.

Republic, July 21.

CANADA.

BRITISH COLUMBIA.

(Special Correspondence).—B. E. Sharp reports that the 100-ton concentrator in operation at La Plata mine, near Nelson, is a success. Owing to the presence of zinc the companies in that district have had difficulties which are overcome by the new concentrator. The ore is mostly galena, running 60 oz. per ton.——The output of the Boundary mines for week ending July 21 was as follows: To Granby smelter from Granby mines, 15,772 tons; from Emma mine, 22 tons; to B. C. Copper Co. smelter from Mother-Lode mine, 744 tons; to Dominion Copper Co. smelter from Brooklyn-Stemwinder, 2,970 tons; from Rawhide, 264 tons; from Sunset, 660 tons; from Mountain Rose, 33 tons; to Nelson smelter from Emma, 100 tons; to Trail smelter from Providence, 40 tons. Total shipments for week, 20,605 tons; total for the year to date, 682,544 tons. Smelter treatment for the week was as follows: Granby smelter, 16,100 tons; Dominion Copper smelter, 3,927 tons; total for week, 20,227; total treatment for the year to date, 687,476 tons.

NOVA SCOTIA.

It is expected that the present financial year, which ends in September, will make a new record for low production from the gold mines, most of the miners having left for Cobalt and the new fields in Northern Ontario. A systematic geological survey of the iron fields is being made and the production from Londonderry and Ten Broek goes on apace. Several of the Government drills are in use—though at Newville the 3,000-ft. core-drill has been replaced by a churn-drill.——During the past year the output from Cape Breton coalfield exceeded 5,000,000 tons and with the expanding markets the prospects for the industry here are bright.

MEXICO.

SONORA.

The San Juan Bautista mines were famous years ago for rich ore, but were abandoned and remained idle for a long time until acquired by George F. Woodward. A company was recently formed at Washington, D. C., and development resumed. A few days ago the miners encountered 3½ ft. of high-grade copper ore in opening up the old workings, and a large body of good-paying sulphide ore was encountered on another portion of the property. The miners also unearthed some interesting relics of this old camp. An old silver and gold hanging-lamp was dug up, together with other utensils. It has been only four weeks since the company began work, and it now has a producing mine and a good showing for two more, where development work is being carried on. Wm. M. Reese is superintendent and George F. Woodward is Western manager for the company.

Personals.

JAMES W. NEILL is at Pasadena.

E. GYBBON SPILSBURY is in England.

H. W. HARDINGE is at Crystal, Colorado.

H. C. HOOVER is expected in California shortly.

R. GILMAN BROWN is at Ymir, British Columbia.

E. MCCORMICK is examining mines near Waldo, Oregon.

J. POWER HUTCHINS is at Elizabethtown, New Mexico.

IVAN RAGAZ is at Santa Barbara, in Chihuahua, Mexico.

HOMER WILSON, of San Francisco, is at Goldfield, Nevada.

J. H. CURLE sailed from New York for London on July 17.

ARTHUR LAKES is examining the Bull Whacker mine at Hailey, Idaho.

R. C. ALABASTER is in charge of the Etruscan Copper Estates in Italy.

FRANK L. SMITH, of the firm of Smith, Parker & Boyd, is at Los Angeles.

D. W. C. NELSON is manager of the North American mine at Burkemont, Oregon.

F. M. RAE is manager of the Gilt Edge mines, at Giltedge, Fergus county, Montana.

STANLY A. EASTON has returned to Wardner, Idaho, from a professional trip into Montana.

GEORGE W. BAGGS is mine manager for a Spokane company at Cornucopia, Oregon.

G. L. EDDY, from the App Consolidated mine, at Quartz, Cal., is in Oakland for a few days.

CHAS. F. SODERLING is manager of the Queen of the West mines at Cornucopia, Oregon.

A. E. CARLTON, of Cripple Creek, is attending the meeting of the American Institute in England.

DAVID H. LAWRANCE, of Breckenridge, has opened an office in Denver at 406 Temple Court Building.

J. W. MESSER is superintendent of the Indiana copper mine, between Baker City and Cornucopia, Oregon.

C. F. LEHMAN is supervising construction work for the Washington Water Power Co., at Post Falls, Idaho.

P. C. MCCARTHY has returned to Lake City, Colorado, from Cananea and other portions of Sonora, Mexico.

JOHN DERN, president of the Con. Mercur Gold Mines Co., has returned to Salt Lake City from a trip to Canada.

SAMUEL L. LEVY, manager for the Annie Laurie Mining Co., operating in the Gold Mountain district, Utah, has resigned.

R. H. ANDERSON is superintendent of the Sullivan Group Mining Co.'s mines near Kimberley, East Kootenay, British Columbia.

J. D. BEEBE and C. M. FUELLER, of Denver, will take charge of the new mill of the Tallapoosa Mining Co. at Yates, Alabama.

B. LASEKE and JOS. WENDELLE are in charge of operations for the Bear Hydraulic Mining Co., at Barkerville, British Columbia.

S. S. SORENSEN has resigned as superintendent of construction with the Utah Consolidated smelter. He is visiting San Francisco.

ARTHUR LITTLE, of Sutter Creek, is the new superintendent of the Bay State mine, near Plymouth, Amador county, California.

B. J. HOXIE, lately foreman of the Keystone mine at Amador City, Cal., is superintendent of the West Tonopah mine, Tonopah, Nevada.

A. KAYE, recently assistant assayer at Le Roi mine, has been appointed to the charge of the Dominion Assay Office, Vancouver, British Columbia.

C. E. SHAFER is superintendent of the Harvard mine on Whiskey hill, near Jamestown, Tuolumne Co., Cal., and T. J. RUSSELL is mine foreman.

W. WESTON is back at his post as head of the mining department of the Denver, Northwestern & Pacific Railway after a severe illness of five months.

CHARLES A. BRAMBLE is now editor of the *Canadian Mining Review*, having succeeded H. MORTIMER LAMB, who resigned on account of ill health.

GEORGE F. WOODWARD is manager and W. M. REESE is superintendent of the San Juan Bautista Mining Co. in Montezuma district of Sonora, Mexico.

JAMES CAMPBELL, of St. Louis, has taken the presidency of the Lluvia de Oro Gold Mining Co., upon the resignation of H. E. CARY, formerly of Salt Lake City.

ROBERT J. COLEMAN, formerly manager of the Samuel Newhouse interests, has been appointed manager of the Lluvia de Oro mines in Chihuahua, Mexico.

CHARLES S. DOWNING, of Kansas City, secretary and treasurer of the Wellington Mines Co., is now at Breckenridge, looking after that company's interests there.

JOSEPH WEISSBEIN, of Grass Valley, formerly of the Grass Valley Exploration Co., is now manager of the Gold Flat Consolidated Gold Mining Co., near Grass Valley, Cal.

ROBERT MUSGRAVE, formerly with the Copper Queen Consolidated Mining Co., of Bisbee, Arizona, has been appointed general superintendent for El Tigre Mining Co., at Yzabel, Sonora, Mexico.

E. J. RADDATZ, who for seven years has been superintendent of the Honerine mine at Stockton, Utah, has resigned and has been succeeded by W. K. MURDOCK, formerly assistant superintendent.

FRANCIS A. THOMSON has resigned his position as superintendent of the New Western Reduction Co., at Goldfield, Nev., and consulting engineer to the Round Mountain Antelope Mining Co., and will shortly proceed to Colorado.

J. D. IRVING, editor of *Economic Geology*, will be absent in Europe in August and part of September. During this time the conduct of the journal will be in the hands of WM. SHIRLEY BAYLEY, who may be addressed at South Bethlehem, Pa., or Echo Lake, Morris county, New Jersey.

W. R. THOMAS, who was the principal factor in the organization of the Central Eureka Mining Co. at Sutter Creek, Cal., and of which mine he has been superintendent for twelve years, has resigned, being succeeded by his brother, JOHN R. THOMAS, who during these years has been foreman of the mine.

Obituary.

THOS. H. SIMMONDS, superintendent of the Bunker Hill and Sullivan mines, at Wardner, Idaho, died at Guadalupe mine, near Los Gatos, Cal., July 14, at the age of 47 years. He was a native of Devonshire, England, and had been prominent in mining on the Pacific coast for the past 15 years.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

New York, Boston and London, July 25.

Anaconda	$248	Standard	82½
Bingham	27½	Tonopah	18¼
Calumet & Hecla	685	Tonopah Ex.	5½
Copper Range	70⅞	Trinity	8
Granby	11	U. S. Mining	54½
Greene Con.	20⅛	Utah Copper	54¾
North Butte	85½	De Beers	£17⅛
Ontario	2½	Rand Mines	£ 6⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 19. £ s. d.	July 25. £ s. d.
Camp Bird	1 4 3	1 4 0
El Oro	1 5 6	1 5 3
Esperanza	3 16 3	3 15 7½
Dolores	2 0 0	1 18 6
Oroville Dredging	0 17 6	0 17 0
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 3 9	1 4 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

IN every mill or mine the management ought to be able to give a reason for doing anything in a particular way.

THE loss of velocity, in a falling stamp, due to friction is about 25%. This friction is mainly due to the contact between the stamp and the guides.

BUILDING STONE is mineral. The Supreme Court of California has decided that granite quarried for industrial use is mineral within the meaning of the law.

THERE IS, on the Colorado statute books, a law which makes it a misdemeanor to jump or take by stealth or violence a mining claim in the possession of another.

IT IS BAD PRACTICE to place a heavy course of brick or stone on top of a boiler, for a thinner coating of magnesian material will answer every purpose and is superior to the brick and much lighter in weight.

TOO HIGH a heat in the reverberatory will cause the ore either to form matte or to convert the iron oxide to metallic iron, which may render subsequent treatment by either chlorination or cyanide process futile.

THE first great cave in the Comstock mines occurred July 15, 1863, when about half of the workings in the Mexican mine collapsed to a depth of 225 ft., much of the debris crushing into the works of the adjoining Ophir mine.

TO follow closely an honest and subtle controversy; and to have arrived at a definite opinion upon some general question of real and practical interest and complicated reference, is assuredly the most educational exercise in the world.

THE TOTAL present visible copper supply of the world, according to an authority, is less than 10,000 tons. So long as the demand continues, and the supply does not increase, the price of the metal must remain at or above 18 cents.

IN the 18th century a large proportion of the metal mines of France and western Europe generally were directed by Saxon engineers, of whom Schreiber was chief. In the 19th century they lost their vogue and were replaced by Cornish mine-captains.

OIL may be prevented from entering a boiler with the water condensed from steam by putting an upward extension on the pipe leading to the boiler, and providing it with a means of tapping off the oil that will rise in the pipe above the horizontal pipe connecting with the boiler.

PHOTOGRAPHY can be employed to good advantage in mining, both on the surface and underground. The promoter has already discovered this fact and usually makes the most of his opportunities, but he unfortunately does not always confine himself to the illustration of the property he is describing, but uses the photographs of other and successful concerns to illustrate his own proposition.

IN the year ending Nov. 30, 1889, the Mount Morgan mine, in Queensland, produced 75,415 tons yielding 323,542 oz. 13 dwt. 13 gr. worth $6,657,424 while the total expenses were $1,138,849, permitting of the payment of $5,500,000 in dividends. The yield per ton averaged 4 oz. 6 dwt. 4 gr. and the profit represented 83% of the gross output. This is probably the most satisfactory mining on record.

LIMESTONE is by no means the only rock in which large deposits of lead-silver ore occur, though not an uncommon repository for that kind of ore. The noted lead-silver mines of the Coeur d'Alene district of Idaho mostly occur in quartzite. In some districts of Arizona, and elsewhere as well, lead-silver ore is found in andesite, and the noted lead-silver ore deposits of Broken Hill, N. S. W., are in garnet schist.

LIGNITE is the lowest grade of coal that is recognized. It is commonly known as 'lignite,' 'brown lignite,' or 'brown coal.' It usually has a woody structure and is distinctly brown in color, even on a fresh fracture. It carries a higher percentage of moisture than any other class of coal, its mine samples showing from 30 to 40% moisture. The localities in which lignite is found are chiefly North Dakota, South Dakota, Texas, Arkansas, Louisiana, Mississippi, and Alabama.

THE MOST PROLIFIC natural-gas well usually produces little or no oil. Where a large volume of gas exists in rock strata it generally issues when tapped by the boring drill under tremendous pressure, in some instances blowing the string of tools out of the hole and wrecking the derrick. One of the most noted gas wells in the world is the McConkey, which flows 30,000,000 cu. ft. per day with a static pressure of 960 lb. per sq. in. Gas is distributed from this well through an extensive system of pipes, pressure being equalized over long distances by means of compressors.

LARGE ELECTRO-MAGNETS are in use in many foundries and machine shops for handling iron and steel. The magnet is attached to a carriage which runs on a traveling crane. It is brought directly over the load to be lifted and the electric current is turned on. It is at once magnetized, and lifts loads in proportion to its size and strength of current. The object is removed to the desired location, and the current shut off when the magnet loses its power and releases its load. By this means the time required for attaching and detaching chains and hooks is saved. Magnets of various shapes are employed in handling different forms of iron and steel.

THE DISCOVERY of rich ore in Utah was made about 1862 by soldiers from Fort Douglas, at Salt Lake City, at that time under command of Gen. P. E. Connor. The Third California Infantry, then at the post, included men who had had some mining experience in California. Gen. Connor encouraged his men to take excursions into the neighboring mountains, and mineral was soon discovered in Bingham canyon, near the site of Stockton, in Rush valley, at Lewiston, in Ophir canyon and elsewhere in the Oquirrh range and in Little Cottonwood canyon in the Wasatch range. In Bingham district, at the time of its discovery, the mountains were covered with heavy timber. The first location was called the West Jordan. It was located September 17, 1863. Mining was expensive in those days in Bingham. A keg of black blasting powder cost $100, a shovel $2.50. The cost of mining and the difficulties of transportation made development slow. The miners of the district passed a law which enabled a claim owner to hold undisputed possession of his claim after having performed a stated amount of work. The first shipment of ore from Utah was a carload from Bingham district. This was sent to Baltimore, Md. The most important mines, however, were producers of rich silver-lead ore—among them the Galena and Old Jordan. Many of the noted lead-silver mines of the early history of Bingham are among the copper producers of today.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Gold Dredging.

The Editor:

Sir—Mr. Curle's criticism in the issue of January 27, 1906, of the dredging industry is timely, and worthy of the attention which he evidently wishes it to receive. I will give a little consideration to some of his points, with reference to the Alaska field, and other regions.

In order to consider this question: Divide, mentally, Alaska into three provinces, (a) South Coast province, (b) Interior province, (c) Seward Peninsula province. Now eliminate all permanently frozen ground. This consideration strikes out at once almost all of the Seward peninsula, including the region about Nome, and all north of Nome to the west of the treeless area. It also bars the whole of the Interior province, with the possible exception of extraordinarily rich creek-beds, like Bonanza creek on the Klondike, where the material has been already loosened and disturbed by previous work, and portions of the Klondike river-bed. The South Coast province only remains. I would, therefore, eliminate from consideration as dredging ground at least four-fifths of the Territory of Alaska.

By the South Coast province I mean the strip extending from the southern boundary, along the coast, north and west; this includes the high frontal ranges of mountains of the Alexander archipelago, the St. Elias and Yakutat districts, Kodiak island, the Kenai and Alaska peninsulas, the Aleutian islands and the area lying between the north shore of Bristol bay and the Kuskokwim river. In the areas mentioned permanently frozen gravel does not occur.

All the territory lying east of the 149th meridian may, I think, be eliminated. Flood plains reduced nearly to base level, in which streams meander, are in my opinion the first requisite for auriferous gravels fit for dredging. Unless this prime geological feature is present, it is not likely that suitable ground exists, and the engineer wastes his time and that of his client in examining the area. As I do not own dredges, and further as I do not have cognizance of any balance sheets except those of the California companies, it is impossible for me to answer some of Mr. Curle's inquiries. I believe, however, that in Alaska there has been no successful operation up to the present time in the South Coast province. It is reported that a dredge built on the Solomon river, Seward peninsula, which has operated during the season of 1905-6, has been successful. We have no published statement about it up to the present, however. Granting the success of this dredge, it is due to exceptional, very exceptional, conditions in that district and latitude, a repetition of which one may not expect to encounter. I therefore unhesitatingly condemn the Seward peninsula as a dredging province. By this I do not wish to say that rich placers do not occur there. The gold is there, but among the methods of working, dredging is not to be considered.

The portion of the South Coast province which appears most promising for dredging lies to the west of Cook inlet, the Sushitna river and to the south of Bristol bay. The tributaries of the Yentna river, which is itself a tributary of the Sushitna, should be investigated. Outside of the area above named, I know of no Alaska area which is worth the dredge-investor's prospective consideration. Mr. Curle asks, How many payable dredging areas are known in the world? I should say portions of California, including the Feather and Yuba river areas, and parts of New Zealand. As regards probable areas, I may be permitted to suggest eastern Russia. I witnessed dredge construction there in 1902. I have heard that several dredges have since been constructed. The factor of climate, to which Mr. Curle refers, needs some definition. If he refers to permanent frost in the gravel, I am in entire agreement with him, and would offer the same objections to the Olekma, Vitim, and Amgoon districts as to the Nome district. If, on the other hand, he refers to the disadvantage of short working season to which northern areas are subject, I do not think his objections altogether valid, as I believe the Ural offers an extensive and promising field for exploration.

The Atlin district is, I will admit, an extremely hazardous locality for dredging. The gravel is not particularly rich. By this I mean that the ancient benches, if worked as a whole (and there is no other auriferous alluvium to be considered there), will not run over 20c. per cu. yd. The wash is extremely heavy, and the thickness is above 90 ft. except in very limited areas. The season does not exceed 150 days, and even this is long for that region. For the matter of gold and its profitable exploitation by some form, Atlin is not without possibilities, but the method will have to be some other than dredging.

Dredging in South America is a fact, but the conditions of access to most of these regions have hitherto been prohibitive, and it may be said that dredging capital will turn its attention to many other parts of the world before hazarding investment in South America. Recently we have heard of a gold and diamond dredging field in the vicinity of Diamantina, Brazil. The ground is now being explored and I understand the gravel is being drilled. It is possible there is a profitable field for dredging investment in this isolated region, but it will be some time before results can be given to the mining public.

Mr. Curle says that probably one-third, or even one-half, the dredges started in New Zealand have worked at a loss. This fact is not a condemnation of a dredging province. In California, outside the comparatively small area about Oroville, Marysville, and Folsom, there are many so-called dredging districts, but the investigator finds that the word dredge is much more common than the word dividend.

In the United States proper, with the exception of the operations already noted in California, the public knows of no profitable gold dredging, from authenticated published statements, although in Montana, Idaho, Arizona and Colorado dredging operations have been attempted, and there are rumors that some dredges have been made to pay. Georgia has furnished one small patch of dredging ground which I believe was payable, namely, that of the Chestatee river, below Dahlonega. I do not think it impossible that limited portions of river beds in auriferous areas of North and South Carolina and Georgia may yet be profitably dredged. It is highly probable that in Burma and British India dredging fields will yet be found. The peculiar conditions of weathering which exist there in the auriferous belts should afford the proper conditions for soft bedrock, and the portions of the river flood-plains, lying midway between the sources and the sea, should be prospected.

In regard to the amount of gold which is produced yearly by dredges, Mr. Aubury has told us from reliable data how much is produced in California, and I believe this represents nearly the whole product of the United States. The amount produced in New Zealand I have no means at present of knowing; the amount produced in other parts of the world is at present insignificant. The estimate of future production in California is conservatively $200,000,000, as may be deduced from Mr. Aubury's figures.

I should say that the number of dredges in all parts of the world which are working at a profit does not exceed

one hundred. Of the number of dredges which were once worked and are now not working, one can form only the roughest estimate. If one hundred are working at a profit, it is safe to say there are five times this number idle or abandoned. Although this seems a large penalty to pay for experimental work, if the expenditure eventually results in the establishment of a sound producing business in various parts of the world, it will not be considered excessive.

The precise costs of dredging in various localities are probably known to Mr. Curle as well as to anyone. Eight cents at Oroville, 80c. in the Klondike, and 50c. per cu. yd. in the Seward peninsula of Alaska, are the figures of which I feel fairly sure. The high cost in the Klondike is where gravel is thawed by steam-points in front of the dredge as it progresses. The Alaska figure assumes a season of 120 days, and delays are occasioned by annual, but not permanent, frost. New Zealand costs are said to be very low, but I have no figures at hand.

Regarding costs in the Ural region, which I have indicated as the best field in the Russian empire, all conditions considered, I would allow an average season of 180 days. The cost on this basis, assuming a ten-year life, not to exceed $500 per acre for the ground as purchased, $75,000 each for the dredge installations with a capacity of 1,500 cu. yd. per day, in 30-ft. average ground, is 14c. per cu. yd. This is taking the highest figure for operating at Oroville and adding to it depreciation, amortization, and interest on total invested capital, making an extra charge of six cents per cubic yard.

In general, the cost of dredging is not seriously affected by nature of deposit for the reason that dredging in deep ground, for example 60 ft., merely increases the first cost of installation and does not seriously affect the operating cost. Ground containing numerous and large boulders cannot be dredged at all, so this kind of deposit need not be considered. Likewise ground with too great an overburden of turf or muck cannot be profitably dredged. Likewise ground which is too shallow cannot be dredged, but should be worked by steam-scrapers. By elimination of the objectionable types of ground, it will be found that the cost of working real dredging ground will not greatly vary in California, Burma, or European Russia. If anything, the operating costs will be somewhat greater in the two latter countries. As regards power, where dredges are operated as at Oroville by a general power-system, the cost will be less than for self-contained dredges operated by steam, unless fuel is remarkably cheap.

Prospecting of dredging ground should be done by pit-sinking if possible; as this method is rarely feasible, drilling with churn-drills is generally requisite. This subject has been so thoroughly discussed recently that I shall leave it to those best qualified to answer. For the determination of the proper factor to apply in each case of an examination, I unhesitatingly recommend the sinking of a pit around the drill-hole if possible, in at least ten per cent of the number of holes drilled, to check the drilling results.

The proper valuation of dredging ground should be made on a system which eliminates all doubtful territory from consideration. For example, in a base-level valley suitable for dredging there may be an average width of 1,500 ft. of gravel-flat covered by marsh, forest, underbrush; in any of which an open-cut to accommodate the dredge-hull may be dug. There may be a meandering stream four or five feet deep, which is subject to spring freshets occupying 500 ft. of a given cross-section of the valley. The danger of working in this stream should be taken into consideration, as the dredge may be wrecked by a flood, if operations are attempted in the present water-course. Let us say that all the area outside the limits of the river is workable. But at best, only a small area near either bank in the river itself is dredgable, and it is a risk to allow for the gold which may underlie the main body of the present stream. To this it may be objected that in certain dredging areas the auriferous channel is coincident with the course of the present river. I reply that an area presenting such geological conditions is not in a bona fide dredging province, as it does not represent dredging ground founded on the Oroville province as a type; namely, where the gold is fine and distributed with a fair amount of uniformity over a wide, comparatively shallow area.

In further considering the valuation of dredging ground, I would urge the suggestion that while operating expenses have been published in considerable detail, the valuer of dredging ground has few data concerning the cost of ground and equipment. If operating expenses at Oroville, for example, are being reduced to five cents per cubic yard and under, what additional cost per cubic yard must be figured for the annual consumption of the ground, and to allow for the amortization of the machinery? Scrap iron is no great asset, and that is all a dredge amounts to after the gold which it is winning for its owner is removed.

I think it must be confessed to inquirers like Mr. Curle, that the proper system of valuing ground on such a basis as to show the probable net proceeds of the operation, has not been discovered. At least I have never seen published a balance sheet of a gold-dredge which shows how much it earns over all expenses. Oroville has given us the data for estimating actual as against theoretical work in cubic yards handled. The present excessive cost of, and time consumed in, repairs will probably be reduced, but Oroville experience gives us the best basis for estimating, as yet. The life of the property can be determined by prospecting, and the yardage and cost of each dredge being a fairly well-determined factor, operating cost being estimated from local conditions, the eventual net proceeds ought to be foretold with a fair degree of accuracy. No valuation of dredging ground which does not thus allow for amortization of the total preliminary expense of acquiring, prospecting, and equipping, in addition to fixed charges for operating for a given length of time, appears to me worthy of consideration.

C. W. PURINGTON.

Denver, July 15, 1906.

Milling Gold-Bearing Cement.

The Editor:

Sir — Having at different times abstracted from your columns and your book on 'Stamp Milling of Gold Ores' data that have been of value to me, I herewith hand you some facts concerning the extraction and milling of some 80,000 tons of gravel that may be of interest to some of your readers. The mine in point is situated on the Big Blue, North Blue, or Ancient Yuba channel, according to what authority you consult, at Blue Tent, Nevada county, California, and is known as the Canfield or, more properly, the Drescher mine. A tunnel has been driven under the channel for 1,500 ft. in a southwest direction from Cody's ravine on the east rim, tapping the channel by a 40-ft. raise on the short arm of one of its swings.

From this raise, drifts are swung each way to the limits of the claim. Power-drills are used in the tunnel and in gravel. Mules are employed in the main tunnel, transporting ten 1¼-ton side-dumping cars per trip. A maximum of 105 cars per 10-hr. shift has been landed in the mill. The mill is equipped with two Blake rock-breakers. There are double bins, with Challenge self-feeders and three 950-lb. stamps for prospecting operations, and twenty 1,000-lb. stamps for regular work. Water under several hundred feet pressure operates Pelton wheels and gives the power required. The gravel varies in charac-

ter from very tough to soft; some of it going through the mill at the rate of 13 tons per stamp. The mortars are narrow and cast with a flare toward the screen. The depth of mortar is 7½ in., the height of drop is 7 in., and the number 85 to 96 per min., both factors being regulated according to the character of the material crushed at the time. Chrome-steel shoes and cast-iron dies are used; the dies last about 3½ months, and the shoes twice as long.

The screens are double-crimped wire with 49 holes per square inch. They last about three months. The height of discharge is four inches. Inside amalgamation is used, but the recovery in the battery is less than 10%. Loss of quicksilver is 1 dwt. per ton, or about one-seventh of a

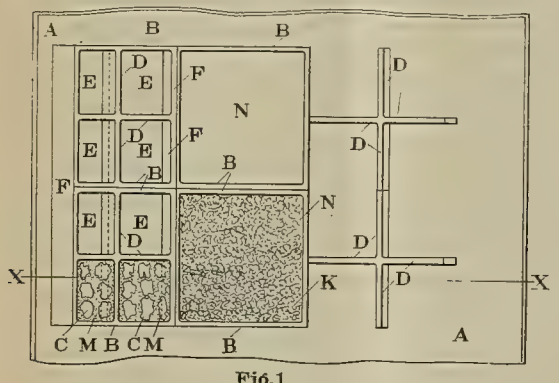


Fig. 1
Tube-Mill Lining. Plan.

cent. The plates are 54 by 48 in. long, followed by riffled sluices 48 by 48 in., with quicksilver in riffles, then by a 24-in. riffled flume (from each 10 stamps) to the 12-ft. distributer of a 12 by 12-ft. undercurrent; the pulp is here diluted by water from the Pelton wheel and is dropped through spaced holes onto the body of the rock-lined undercurrent; 50,000 tons put over this last apparatus returned one cent per ton.

The order of drop is 1–5–2–4–3; one stamp-battery was run 1–4–2–5–3 for some time by way of comparison, but the output was never equal to that obtained when employing the order first mentioned. As the plates became worn the first riffles accumulated more amalgam, but very little got below this point.

WALLACE J. WILLIAMS.

Nevada City, California, July 12, 1906.

WITHIN the past year tungsten minerals have been found in the Black Hills of South Dakota, in veins of white quartz, associated with columbite and tourmaline, the three minerals and the quartz constituting nearly the entire vein. These veins are for the most part enclosed in schist, although one wall may be the Harney Peak granite. The deposits vary from a few inches up to six feet in width. The quartz outcrop is prominent, and the veins have been traced for great distances along their strike. They usually strike northwest-southeast parallel with the cleavage plane of the schist. The deepest development on these veins at the present time is at the property of the American Tungsten Co., three miles east of Hill City, Pennington county, where at over 100-ft. depth little, if any, change is noticeable in the constituents and general character and value of the ores.—*Black Hills Mining Review.*

THE contention for uniformity of action throughout geological time is based solely upon the value of man's personal evidence, and when the term of this is compared with that term beyond which it does not extend, the propositions are such as to render it comparatively valueless.

Tube-Mill Lining.

Those who operate tube-mills will not need to be told of the want of a cheap and durable form of lining, for this is one of the practical problems in this branch of milling. At the Waihi mine, in New Zealand, the tube-mill has proved most effective for re-grinding and the practice has been developed under the direction of Mr. H. P. Barry, the superintendent of works. Formerly at Waihi they crushed under stamps to 40-mesh, and the finer the pulp discharged from the battery, the better the extraction in the cyanide annex; but there was a limit to fine crushing, for beyond 40-mesh the duty of the stamps was decreased until excessive pulverization was no longer economical. Now the stamps crush only to 15 or 20-mesh and the battery product is re-ground in tube-mills to 150-mesh. There was lots of trouble and expense in con-

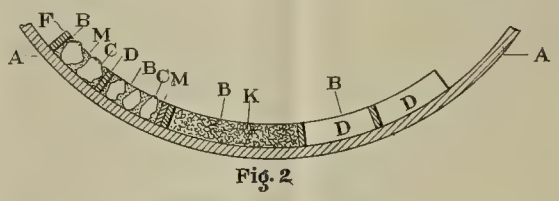


Fig. 2
Tube-Mill Lining. Section.

nection with the lining of the tubes, for the distance of New Zealand from Europe represents a maximum length of transport. The silex from Iceland had to be laid with a special cement and the fitting of the pieces was troublesome. It cost £80 to line one tube-mill, and the time of service was only three months. Now Mr. Barry employs an invention (patented) of his own, whereby he utilizes the flinty portions of the Waihi ore and lays them in portland cement; the lining lasts six months and costs £40—the service is twice as long at one-half the expense, it is four times cheaper.

This lining is illustrated herewith, by courtesy of Mr. Charles Rhodes, general manager of the Waihi Gold Mining Co., Ltd. It is called Barry's honeycomb liner and it is formed of cast-iron segments, curved to the shape of the tube, in sections having four or six divisions, each four by six inches. In actual operation it has been found that the costs are:

Honeycombed casting, 28 cwt. @ 15s.	£21
Broken quartz, 5 tons @ 20s.	5
Portland cement, 1 ton at mine @ 11s. per cask	1½
Sand (rough tailing), 1 ton	1
Labor, @ 9s. per day	8
	£39½

We are informed that the Waihi company is making the casting in its own foundry for 12s. per cwt. and that the cost put down for broken quartz is rather excessive, so that the liner can be made for £30. The saving is about £260 per tube per annum, as compared to the old method. As the Waihi company is about to use 10 or 12 tube-mills, the saving will be important, about $15,000 per year.

We quote herewith from the specification of Mr. Barry's patent, and accompany it with two of the diagrams that accompany that claim for patent:

The purpose of this invention is to provide a cheap and effective grinding surface within tube-mills and other grinding-machines. This purpose is attained by fitting within the tube-mills shallow frames or boxes of hexagonal or rectangular form shaped as is hereafter stated, or in any other shape which will conveniently fit, and in fixing therein a material composed of rough blocks of stone or other substances suitable for the purpose. The accompanying drawing shows 16 figures of which Fig. 1 is a plan illustrating a portion of the inside of a tube-mill and showing different formations of frames or segments with

material fixed in parts, while Fig. 2 is a cross-section through X-X of Fig. 1.

The tube-shell A of the grinding-mill is shown in Fig. 1 and 2 in part and broken, as it is only necessary to show a portion to illustrate the different formations or segments B fixed and which may be fixed therein. Fig. 2 being a cross-section only, the depths of the formations or segments B are shown, but Fig. 1 being a plan, their shapes are shown more fully so that the idea of their purpose can be fully seen while the rough stones C shown in both figures quite illustrate the advantage of their use.

The frame and box formations B, hereinafter called segments, are made with or without bottoms of iron, steel, or other suitable material and in convenient sizes shaped to fit inside the tube-mill, as shown in Fig. 1 and 2, and to retain the lining material in position. The segments B may have ribs or bars D preferably shaped across to help hold the lining material C in place and so as to limit and reduce the size of the segments B into smaller compartments E to suit the particular nature of the lining material used, or rib or bar formations D may be used by themselves without outer frames.

The outsides F of the segments B may be formed plain and made to the radius of the tube-mill and so form an arch which will key each segment B in position, or the outsides of the segments B may be rabbet-formed so as to interlock with grooves therein into which locking-bars of iron or steel or other suitable material may be put. The segments B may be bolted or otherwise suitably connected to the tube-mill, but as a rule this will be unnecessary.

To prepare the segments B for use they are placed upon a firm surface approximately of the same radius as the inside of the tube-mill when they, the segments B, are well filled with the lining material either in the form of concrete K or of rough blocks of stones C, the stones being jammed in tightly and the interstices between them being filled and rammed with cement, concrete or cement mortar M or suitable material which can be poured in, in the shape of grouting, if the spaces between the stones are small. The lining material may be fixed to be quite rough as shown at C in Fig. 2 and it will preferably be made to project in irregular formations above the edges of the segment B and ribs or bars D, as it will thereby protect the edges from undue wear, and by its irregular surface assist the grinding capacity of the tube-mill or machine. The lining material may be of quartz or any hard rock or material that will do the work required of it.

After giving the cement concrete or the cement mortar M or concrete K or other lining material in the segments B ample time to set hard, the segments B are built into the tube-mill or machine with cement or other suitable binding material and the locking-bars are driven in when found necessary to use them. If found advantageous to do so, the segments B may be built into the tube-mill or machine empty in the first place and then the different compartments can be filled with the lining material in the manner above described. When the different segments B have been fitted to within the tube-mill or machine and the lining material filled and fixed therein, the tube-mill or machine will be worked in the usual way but with a much more effective and marked result than is now obtained without the use of the lining material herein specified. After the tube-mill or machine has been working for some time, the lining material should be examined, and if any of it is found to be faulty or unfit for use, the segment B into which it is fitted or fixed can be re-fitted by having the faulty lining chipped, broken and taken out and fresh lining material filled in, in the manner already described.

Crushing and Grinding Practice at Kalgoorlie.

Written for the MINING AND SCIENTIFIC PRESS
By ALFRED JAMES.

At a moment when one hears so much as to the relative advantages of stamps and the ball-mills, tube-mills and pans, one is apt to overlook the particular practice which has led to the introduction of a special type of machine to effect a certain definite reduction on a definite class of ore. Thus, for example, pans were introduced at Kalgoorlie to collect coarse gold from the furnace product, to get rid of soluble salts before cyaniding, and to grind coarse on sintered particles of ore. For this purpose pans have proved remarkably successful and if the all-roasting process had continued unchallenged, probably they would have maintained their superiority unquestioned.

But the advent of Dr. Diehl and bromo-cyanide changed all that, or rather, for a time, threatened to do so. Dr. Diehl claimed to be able to do away with roasting entirely, and to attain this object a new type of ore-reducing machine—a fine slimer—was necessary, and he introduced the tube-mill for this purpose.

It is necessary at the outset to bear this distinction in mind, for if the all-roasting process becomes once more universal or if it is possible by closer or improved concentration to reduce the refractory material (that is, the sulpho-tellurides) in the pulp to an inappreciable or immaterial amount, then it may be reasonably expected that, with the absence of the necessity for fine sliming, pans will prove advantageous rather than tube-mills on account of their lower horsepower per unit, their greater convenience in working, their capacity for amalgamation, and the granular nature of their product. These remarks refer to the Kalgoorlie practice only and not to districts where, for example, the finest comminution possible per horsepower unit is necessary for effective amalgamation or for a high extraction generally.

Therefore, similarly, given an ore which yields the most profitable result by roasting, we can scarcely expect stamps to be preferred for crushing purposes, because the question, for example, of drying the ore is of greater moment than the less repairs required by stamps as compared with ball-mills. The latter, moreover, appear to have the further advantage of requiring less power per ton crushed, yielding as they do an output of two tons of hard ore per h.p. day through 30 to 40 mesh or 2½ tons per h.p. day through a 25-mesh screen—a record unapproached by stamps, which require re-grinding appliances absorbing considerable power when large outputs (7 to 10 tons per stamp) are to be attained. The best practice known to the writer in this direction with the ordinary gravitation stamp is 336 tons coarse crushed by 40 stamps (1,250 lb.) for 120 h.p. plus an extra 60 h.p. for the tube-mill necessary to crush the 240 tons coarse product to, say, 30 to 40-mesh, or under two tons per h.p. day.

It thus appears that stamps will be preferred only when the ore yields a considerable proportion of gold on the plates and when roasting is not to be adopted. At Broken Hill, where there is no amalgamation, the crushing being preparatory to wet concentration, they even prefer to wet-crush in ball-mills rather than stamps, but sufficient data are not yet available to establish the economy of this practice.

As to the relative efficiency of the ball and Griffin mills, apart from the questions of cost, power and repairs, the regular granular product of the ball-mills appears so much superior for roasting purposes to the cement (fine plus coarse) granules of the Griffin mills, that it looks as if the latter would not continue in favor, though one can

quite understand their installation years ago when dry-crushing results were less established.

And now as to pans versus tube-mills: If better concentration can show a reasonably free cyaniding product, then the necessity at Kalgoorlie for tube-mills disappears with the theory of a complete non-roasting treatment, which as stated above was the primary cause of their adoption. But it is by no means yet decided—rather the reverse—that concentration, as practised in this district, is yielding a product capable of being bromo-cyanided without the very finest sliming, such as it appears tube-mills only can as yet accomplish. It must be remembered that even the finest sliming gives only comparatively fair results on the material that is bromo-cyanided. It was the amalgamation recoveries from the old Lake View and Hannan's Star plants which brought the percentage recoveries to so high a figure, and an attempt to obtain Dr. Diehl's bromo-cyanide extractions by bromo-cyanide alone without Dr. Diehl's bromo-cyanide method—tube-mill fine-sliming—is apt to yield as poor results as are shown by one of the best known mines at Kalgoorlie. Even though the ore of this mine is supposed to be comparatively free from refractory minerals, the residues are reputed to be the highest in the locality—2½ dwt. per ton.

Surely, in comparing the relative efficiencies of pans and tube-mills, an extraction test would have been more useful, more accurate and more practical than the pan versus tube-mill test published by the Ivanhoe Company. Of what value is a 150-mesh minimum when dealing with the classification of tube-mill products?

But with regard to these tests, they were not referred to more definitely in my remarks published in *The Engineering and Mining Journal*, because it was evident from the immatureness of the methods that the results of the tests were unworthy of serious consideration. One's chief regret was that names of such high standing should have been tacked onto tests so badly carried out. To those conversant with tube-mill work, it is unnecessary to insist on the absolute need of keeping the feed-pulp free from slime and for taking the finished product away from the mill immediately it is formed; but the Ivanhoe not only included a huge proportion of slime in its feed—returning the finished product to the mill instead of taking it away at once—but, by the intermediate working of the test on alternate days, actually had the flints coated with slime at the start of each daily test.

We have the extraordinary position of a man who discovers that an original feed or more than 26 tons per day chokes his tube-mill, actually feeding no less than 26.77 tons of finished slime (finer than 150-mesh), or more than he takes out (25.15 tons) for his daily output. Could anyone expect a mill thus choked to do effective work? Can anyone longer wonder why the results show only a fraction of the work done per h.p. unit consumed, compared with that done elsewhere by the same h.p. unit? And so it happens that we have seen published all over the earth, results which must be due to the enthusiasm of inexperience, rather than to any attempt or desire to deliberately mislead.

The actual daily *production* of the tube-mill choked with fine slime was only 16.74 tons of '– 150' slime, although the daily output—including the returned slime re-ground—was no less than 43.46 tons. Could anything be more misleading than figures made out on such a basis? One is tempted to wonder why the metallurgist responsible did not go a little further and reduce the position *ad absurdum*, by returning all his finished product, thus proving that the tube-mill was doing no work at all!

The tests were thus unworthy of serious notice mainly because the lack of opportunity for the free escape or removal of the finished tube-mill product reduced them to an absurdity. On the other hand the pans—especially the first pan—were allowed a much better opportunity of getting rid of their finished product, though even here the arrangements might have been improved. The first pan received only 7½ tons of slime with an original feed of 21.3 tons of sand, as against the tube-mill quota of 26.77 tons of slime with an original feed of 19.5 tons of sand only. Had some more efficient comparison of the product than the 150-mesh screen been available, the effect of the continuous re-grinding of the tube-mill finished product must surely have been apparent.

In the above remarks reference is made to the slime grinding-tests only. I have already shown elsewhere that given the ordinary costs of flints and liners in place of the extraordinary costs stated, the advantage lay with the tube-mill even apart from the considerations of limitation of output referred to above; and this remark refers also to the fine grinding (breaking down coarse sand) experiments. Setting flints and liners down at 1.75d. to 2d.—which is the ordinary cost—the relative costs per ton ground are 8.86d. for tube-mills, as against 10.32d. with pans.

In this connection it is curious that in Western Australia they should still use cast-iron linings, which appear to have become obsolete in other places. In the recent discussion at Johannesburg Mr. Leupold, general manager of the Treasury mill (using the Krupp tube) stated that he entirely concurred with Mr. Dowling as to the superiority of flint liners, "which roughly cost one-half and last twice as long as the chilled iron ones."

Pans have proved themselves reliable, efficient, and convenient where roasting is employed, but there appears as yet no proof of such efficiency on unroasted sulpho-telluride tailing; on the contrary, the evidence to date seems all in favor of the use of the tube-mill on such material.

By the way, one cannot but be surprised at the difference of opinion obtaining locally as to the working of pans. No two neighboring metallurgists seemed to be of the same opinion. Thus at the Ivanhoe, the compensating-weight rings are highly thought of, and much has been published about them, but at the next mine visited, I was informed that the compensating-weight rings had been thrown out, as having proved of no advantage whatever. At the next mine I was told the old original 8-ft. pans first introduced were the best pans on the field, and these 8-ft. pans are being adopted for the most recent plants. There is need for authoritative work to be done in this matter, and I hope that Messrs. Klug and Taylor will continue their valuable investigations into the subject.

A curious result of the introduction of electric power is that ball-mills (No. 5) formerly rated at 17 to 24 h.p. (steam) are now rated at 40 h.p. (electric). As a little over 200 h.p. (steam) is running nine of these mills at Kalgoorlie with three fans and all the shafting, and as 24 h.p. is about the highest figure indicated for a No. 5 Krupp mill with full charge and running 10% over normal speed and including shafting, etc., there must either be a lamentably poor efficiency of the electric motors or else the electric rating is inaccurate.

LOGICAL CONSEQUENCES are the scarecrows of fools and the beacons of wise men.

THOSE who refuse to go beyond fact rarely get as far as fact; and any one who has studied the history of science knows that almost every great step therein has been made by the 'anticipation of nature' that is, by the invention of hypothesis, which, though verifiable, often had very little foundation to start with; and not infrequently, in spite of a long career of usefulness, turned out to be wholly erroneous in the long run.

The Recovery of Copper from Mine-Drainage.

Written for the MINING AND SCIENTIFIC PRESS
By PHILIP ARGALL.

In a former article* I described, somewhat generally, various early methods for the recovery of copper from mine-drainage, and more particularly the practice at the Wicklow copper mines in the middle of the eighteenth century. The following notes are mostly from personal observation and in part descriptive of my own work in the Cronebane mine (one of the Wicklow group) about thirty years ago.

The Cronebane and Connorree mines were richer in copper than any others on the great pyritic vein of County Wicklow. The early day precipitation plant of the former had disappeared before my time, but the Connorree plant was in operation from my first recollection. A brief description of it will show what was the best practice for the recovery of copper from mine-drainage in the early 'seventies.

The water issuing from the pump-head passed through two or three cisterns in order to settle the grit; from the last of these it flowed into a launder about 15 in. wide by 12 in. deep, set at an inclination of about ten per cent. The bottom of this launder was strewn to a depth of four to five inches with broken cast-iron or old wrought-iron scrap, cut into short lengths, but preference was given to cast iron, and more particularly soft gray cast iron. The scrap for the 'copper pits,' as they were called, came from all over the country, and everything in the nature of iron was purchased as offered, so there was seldom much choice of material.

At intervals of about 500 ft. along the course of the precipitation-launders, boxes or hutches about 5 by 10 ft. and 6 ft. deep, were set in the ground, slightly lower than the launders, so that the water from the latter could be diverted into the hutches at will. The irons in the launders were brushed and turned over, twice daily, to dislodge the copper precipitate and wash it into the hutches. The operation was carried out in the following manner: First, the water was turned off from a section of the launders, and when the receding water had exposed the irons, one man proceeded to brush them with a stiff birch-broom, to remove the accumulated copper and, in part, insoluble graphite; the water was then turned on with full force, washing the copper precipitate before it. The man with the first broom managed to keep slightly ahead of the flowing water, and on reaching the first hutch, turned the stream in there. The second man turned the metals over with a two-prong rake, exposing other surfaces to the action of the broom following him. The men timed their work so that the hutch was usually about full by the time they reached it. The water was then diverted from the hutch and continued its course along the main launder; the next section was then treated in a precisely similar manner, and so on to the end of the series.

The water and suspended copper which entered the hutch were allowed to settle for 12 hours, and the supernatant water drawn off through plug-holes, leaving the hutch ready for the next sweeping. By these operations the fine copper was removed from the iron and stored in the hutches until clean-up day.

The hutches were cleaned out every quarter and the precipitate passed through a screen of about one-tenth inch aperture, the coarse pieces retained on the sieve being usually returned to the launders to be further cut down by the acidulous waters. The launders were also cleaned up once a quarter; each piece of iron was taken up, brushed free of adhering copper, and returned to the launder; the finer material was shoveled out, screened and hand-picked, the coarse pieces of copper going to one barrel, and the clean iron particles returning to the launders, while the rust and scale were, after careful washing, rejected.

As the copper contents of the solution became less, there was a tendency for ochre to deposit on the iron, usually impairing and often completely arresting the precipitation of copper. This condition of affairs could be improved, for a time, by augmenting the velocity of the flow, by increasing the inclination of the launders. It is a curious fact that a sluggish stream of partly spent mine-water would simply coat the irons with ochre, whereas a rapidly flowing stream of the same drainage would coat the irons with a skin of bright metallic copper. Furthermore, water falling for some distance on iron gives a coating of tough metallic copper, whereas the copper deposited from fresh solutions of mine-drainage, at rest, or of low velocity, was invariably granular and easily detached from the iron. In some places where plenty of fall was available, the partially spent solutions were turned down over a steep stairs, the steps of which were covered with heavy pieces of iron scrap, which in time became coated with envelopes of coherent copper that often required to be cut off with chisels, and always had to be removed by some force; these envelopes were practically malleable copper.

From the foregoing remarks it is evident that a gently sloping hillside is the proper place for a precipitation works, and on such a site the Connorree plant was laid out, offering every facility for increasing the angle of inclination, as the solution became spent; then turning the water over a stairs, where a little more copper was precipitated, and, more important still, the ferrous salts were partially oxidized. Following the stair-like structure, came large reservoirs, or ponds, in which the reactions were completed, resulting in settling the ochre and clarifying the solutions. The ponds, four in number, were about 50 by 400 ft., the solution passing lengthwise through the pond, entering another series of precipitation-launders at the further end, and so on through four cycles of (a) precipitation of copper, (b) oxidation of the soluble salts (c) precipitating the iron in part, or the settling of the ochre and the commencement of the cycle over again with a solution considerably poorer in copper.

The copper precipitate was usually dried on cast-iron plates set over flues, through which heated gases meandered from the fire-place to the stack. The precipitate was repeatedly turned over on the plates and care was taken to prevent it from burning, which would reduce its copper tenor; the oxidation of the fine copper precipitate took place at a very low temperature, and had to be carefully watched. The dry precipitate was finally packed in barrels and shipped to Swansea, Wales, to be smelted.

In the Connorree dry-house a man, whom I often met in my school days, had dried and barreled the copper precipitate for something over 40 years, and notwithstanding the amount of fine copper he inadvertently consumed during this long period of service, he retained excellent health till beyond the allotted span of three score and ten, not even having a gray hair; but it must be recorded, he had green ones instead, his hirsute appearance, with green mustache tips and ample forelock of similar hue, together with patches of green hair around his ears, was truly startling; he was, nevertheless, a genial and kind-hearted Irishman. Many times in after years, when listening to dissertations on the poisonous nature of copper compounds, or in reading of them, I have recalled the incident of the verdant friend of my youth, and retained my original and early formed conclusions.

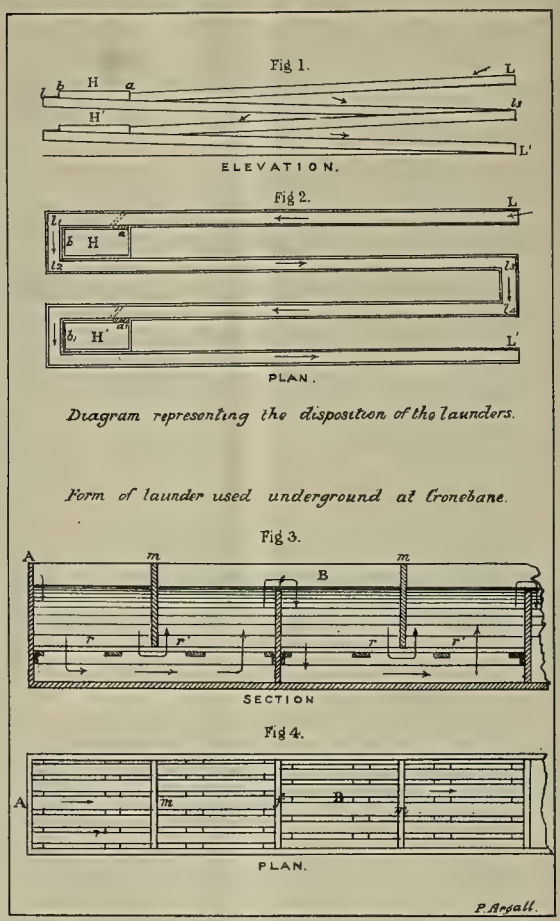
Fig. 1 shows diagrammatically in plan and elevation the precipitation plant of the Tigroney mine. L is the launder; H, the hutches to receive the fine precipitate at

*MINING AND SCIENTIFIC PRESS, May 19, 1906.

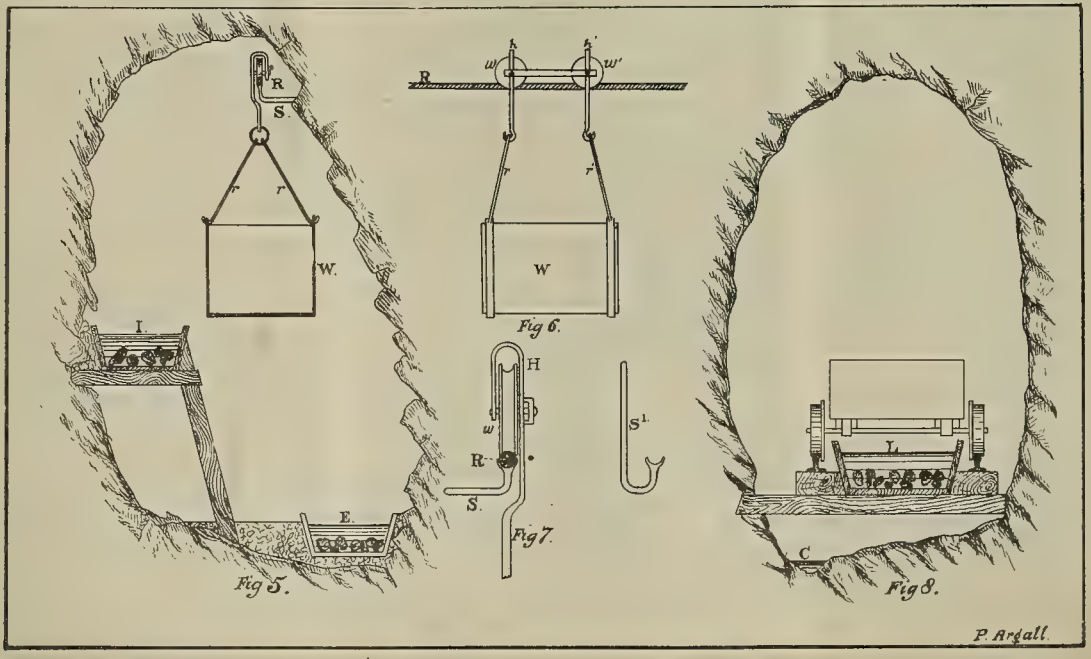
such times as the irons were brushed and freed from their deposits of adhering copper. This plant was constructed about 1860. The plates are reproduced from a paper, published by the Royal Dublin Society in 1882, of which the late Gerard A. Kinahan and myself were the authors.

In a previous paper I have stated the reason for conducting the copper precipitation within the mine, or in and adjacent to the main adit. For the first experiment, the cuprous waters were carried in a pipe to the launder I, in Fig. 5, which was carried forward at a slight inclination until the floor of the level was reached, then the launder was returned along the floor as indicated at E. This work occupied an unused and unventilated portion of the main drainage adit, the end of it in fact, and the first startling result was an explosion of accumulated hydrogen gas, which slightly burnt some of the men, and brought the Government Inspector on the scene, with the result that the workings had thereafter to be inspected by a duly appointed fireman, carrying a Davy lamp, before the workmen were permitted to enter. The precipitation, however, was a great success, as owing to the solutions being rich in copper, clear, and warm, the precipitate was unusually pure, averaging in large lots 80% copper.

At first the irons were brushed every day, and the water carrying the fine precipitate was pumped into a cement-lined cross-cut, which served as a hutch; later, however, it was found that a higher grade precipitate could be obtained by only brushing the pig iron twice a week, and this practice prevailed. The labor required to carry the pig iron *in* and the copper precipitate *out* soon proved onerous. As the level was too small to accommodate a car together with the launders, hand-barrows were used until the mono-rail system, illustrated in Fig. 5, 6 and 7, was established, where R is the rail, S the rail support, made in two forms; one for a side support; the other S^1, for a roof support. Holes were drilled in the rock, filled with soft wood, and the support S driven in; the rail, which was a 1⅛-in. steel cable drawn taut, was then placed in the saddle of the supports, which were hammered tightly around the rope to hold it firmly in the saddle. The level was very crooked, so that a rope lent itself better to the sinuous course of the drift than anything else we could think of. Fig. 7 is an enlarged view of the wheeled carriage, the mono-rail, and the side supporting hook S. The box W held 800 lb. cast iron and was pushed along by a man, as in the case of an ordinary mine-car. This apparatus, placed in operation in 1875, was an unqualified success, and, as far as I know, it is the first application of the mono-rail system in a



mine. The idea originated with the late Capt. George Oates, manager of the property. Fig. 8 is a section of the Mosey adit, showing a form of precipitating launder (L) and car-track designed by myself in 1875. The space (C) below the spreader was to accommodate flood-waters and



also for diverting water from the launders prior to brushing and dressing the irons. The car was only used for transporting pig iron and copper precipitate to and from the Magpie shaft, which intersected the adit at 200 ft. below surface. This particular plant extended for 2,000 ft. along the Mosey adit, and had at intervals suitable hutches for collecting the copper precipitate; these were shallow winzes lined with cement, out of which the clear water was pumped prior to brushing the metals in the launders, or cement-lined cross-cuts, the mouths of which were built up with brick and cement for a height of about four feet, and into which the water carrying suspended copper precipitate was lifted by a hand-pump. The upper portion of this launder system was raked and brushed twice weekly, while the lower portion required daily attention to dislodge the ochre accumulation, otherwise the pig iron would be glazed over with ochre and protected from the action of the water. In this case neither settling ponds nor increased velocity of flow could be arranged for, and so the economic limit of underground precipitation was reached.

Fig. 3 and 4 represent in plain and longitudinal section, a form of precipitation box, designed to fill open spaces compactly. In one abandoned station of the Boundary shaft 40 tons of pig iron were exposed to the action of the mine-drainage in these boxes, which, by the way, were most effective precipitators. They were cleaned up monthly and never disturbed between clean-ups, the copper was therefore obtained in coarse crystals and of great purity.

The foregoing notes will give some idea of the extent to which underground precipitation was carried out in the Cronebane mine (1875 to 1879), and the methods used to render it successful. The enrichment of the mine-water by collecting the surface-drainage of waste-heaps, etc., and turning it down through the older mine-workings was an early study, later enlarged to the very wide field of leaching the low-grade copper ore in place. This was successfully accomplished, and I would add that this method of treating low-grade pyritic copper ore is capable of the widest application. It is nature's method but the gradual oxidation of the pyrite can be accelerated by exposing more surface to the moist air and washing out the sulphates when formed. As an instance of the completeness and speed of natural oxidation of pyritic ore the following may be worthy of note: The Wicklow pyrite is slaty and averages about 35% sulphur, with ½ to 2% copper; the latter, however, decreases notably in quantity when depth is reached. In the 'seventies all fine passing an inch screen aperture was unsalable and went on the dumps; these dumps assayed 33% sulphur and looked like mountains of clean pyrite in 1878; they were reduced by natural agencies to heaps of brown slate in 1901, on the surface of which I could not distinguish a single particle of pyrite, and I doubt if the heaps as a whole would assay five per cent sulphur. The reduction in volume through the removal of the sulphur and iron was probably as much as 70%. The coarse pyritic ore does not, however, decompose so readily, even in a moist climate like Wicklow, but the fine, and particularly the granular pyrite, oxidizes very fast, indeed, at surface, and under certain conditions underground also. Portions of the great pyritic lode in Cronebane and Tigroney mines caved to a depth of 250 to 300 ft., crushing down and filling up stopes and drifts; this crushed lode-matter was subsequently mined from main levels driven in the foot-wall country with subsidiary drifts and cross-cuts extending through the caved ground; some of these levels if abandoned for a year would fill completely with iron and copper sulphates, while in the stopes above them, in the crushed lode-matter, the rocks of pyrite were usually cemented together with sulphate. The heat in these stopes was intense, seldom below 100 degrees F., and in some cases reaching 140 degrees F. Where moist enough to form drops these were simply saturated solutions of sulphate; often causing nasty sores on the arms and backs of the semi-nude miners. I knew of one man who through a single drop lost forever the sight of his right eye. Of course in such places oxidation was proceeding very slowly. I was, however, much impressed with the amount of sulphates that could be washed out to enrich the mine-drainage, and quite early instituted a process of periodical leaching with mine-water, followed by a slight caving of the crushed lode-matter to obtain a circulation of air with increased oxidation of the pyrite and formation of sulphate, in turn to be removed by a second leaching and repetition of the cycle.

In East Cronebane — in the Magpie mine — the pyrite under the gossan is disseminated as a coarse sand (in blue or at times whitish clay), having about 20% of the copper existing as sulphate; the clay-gangue renders this lode impervious to circulating waters, consequently the undisturbed zone between the gossan and the solid pyrite, say 150 ft. deep, is as rich in copper today as ever. Knowing this, I succeeded a few years ago in interesting some London people in the re-opening of the Magpie mine, promising them in the zone of moderate enrichment, a width varying from 30 to 50 ft. of 2.5% copper ore. They found a still greater width of this soft clayey ore that averaged 2.79% copper, 0.0625 oz. gold, and 1.3 oz. silver per ton; about 15% of the copper in the ore mined was soluble in cold water and 10% in boiling water; in one sample 46% of the contained copper dissolved in cold water, indicating how easily this ore could be leached of its copper content by the methods I put into successful operation in 1876.

London capitalists have long looked upon Ireland as the Jews did on Nazareth—a place out of which no good could come. The promoters failed to raise the necessary funds to properly explore the property, while it fell to my lot to add to my former somewhat varied experiences a close parallel to that of the New Testament character who undertook to journey from Jerusalem to Jericho.

ARTIFICIAL DIAMONDS.—Many are already familiar with the experiments of the French chemist, Moissan, who was successful in producing artificial diamonds by the employment of molten iron as a solvent for carbon, and using the electric stove, invented by himself, for producing a degree of heat hitherto not reached. Through the intense heat of this electric stove and by sudden cooling of the molten metal, the carbon is separated in the form of very small diamond crystals. The London *Lancet* reports a further step in advance in the production of crystallized carbon through experiments of Dr. Burton, of Cambridge. This scientist has proved that the diamond is a denser form of crystal than graphite, and that a lesser pressure is sufficient for producing artificial diamonds than has been employed heretofore. Dr. Burton in his experiments used a molten alloy of lead and some metallic calcium, which can also hold a small quantity of carbon in solution. If the calcium is separated from the molten mass, some of the carbon crystallizes. The separation of calcium can, for instance, be accomplished through steam. If the introduction of steam is made during full red heat, then small graphite crystals are found in the resulting crust of lime; if the steam is introduced during a low red heat, no graphite is formed, but a number of microscopical crystals are formed, the properties of which are entirely identical with those of natural diamonds. These experiments, which may be continued, strengthen the belief that it may be possible some day to produce in the laboratory of the chemist diamonds of sufficient size and perfection to compete with natural diamonds.—*Graphite.*

An Induction-Motor Hoist.

Written for the MINING AND SCIENTIFIC PRESS
By C. F. LEHMAN.

The direct-current series-wound motor has been used for some time by many of our mines as a means of hoisting ore, but it has been only a short time since the first induction motors were installed for that purpose. One of the earliest of these induction-motor hoists is that of the North Star mines at Grass Valley, California.

The original was a double-drum friction-hoist, with a power-wheel five or six feet in diameter, using a variable quantity of water according to the requirements of speed and load. The shaft is an incline varying in dip from 8 to 35 deg., the greater angle being at the lower levels and especially at the bottom chute of the 2,700-ft. level. As water-power became inadequate for the requirements of the mill and hoist during the summer, it became necessary to make a change.

The company had in service a 50-h.p. 440-volt variable speed M motor, of the General Electric Co.'s make, with full speed of 514 r.p.m. This motor was installed at the 1,400 level to run a five-pole plunger pump, belt driven; being used only as a constant speed motor, it was not possible to run the same for hours on slow speed with the resistance as installed. It was thought best to take this motor out of the mine and use it for hoisting, purchasing a two-speed induction-motor of 75 h.p to run the pump.

A concrete foundation was built on the opposite side of the drums from the water-wheel; an extra shaft, bearings, gear-wheels and friction-clutch were fitted up so as to be thrown into connection with the shaft of the friction-wheels, the arrangement being run by the variable-speed motor, geared to the extended shaft. This makes a good and efficient hoist, which can be run directly by either water or electric power, or by both, should occasion arise. The motor for such a hoist must be one of large starting torque, and should start slowly, to avoid jerks, accelerating gradually and finally acquiring the speed for which it is designed. The speed of an induction-motor can be varied by altering the voltage impressed upon the stator, by altering the resistance of the rotor circuit, or by commutating the stator windings so as to alter the multipolarity.

The first method of reducing the impressed voltage reduces the capacity of the motor and the later method requires complicated commutating devices. By using proper resistance and suitable control in the armature or rotor circuit, a large starting effort is obtained with a limited starting current. This class of motor is so designed as to give a maximum starting torque at least 50% greater than the full-load running torque with about 50% above full-load current. When small starting torque is adequate, the starting current will be proportionally reduced.

The motor at the North Star is that of the resistance in the armature circuit, but instead of being placed in the motor itself, it is external, connection being made to the rotor by rings and brushes. The resistance is then placed under the controller to avoid excessive amount of wire. The controller for this installation is of the type T-7 and similar to those used in our trolley cars. The controller is placed alongside the water-hoist regulator and brakes, which is 100 ft. from the motor. The two sets of resistance or rheostats are on a built-up platform five feet below the floor and directly under the controller, making the wiring work easy. An extended rod with right-angled gears and rods was attached so as to operate the controller from either side of the landing, to operate both compartments of the shaft. The resistance for the primary circuit is provided to reduce the sudden rush of current and permit of a gradual increase. This resistance is practically cut out before resistance is taken out of the secondary circuit.

On our first trials, I found the secondary resistance too small for satisfactory results and had new iron girds cast at the foundry of twice the length and twice the thickness, with the result that we could hoist with full-load cars, at any speed up to a maximum without excessive heating of the rheostat. When hoisting ore, after starting, the controller is gradually turned around to the full-speed notch and thus the installation works at its highest efficiency 95% of the time. Men are hoisted at from half to three-quarter speed.

The engineers at the hoist much prefer electric power to water, because it is easier controlled; the speed is more uniform and without such jerks at the changes of grade as are experienced when employing water-power. The reason for this is that the slip of the rotor of an induction-motor is small as compared to the sudden change of speed of a water-wheel under the same conditions, with a limited amount of power, as is the case when not automatically governed.

A test of the current required by the hoist, with cars loaded with one ton of ore, was made and the results were satisfactory, contradicting the opinion held by many that the current would be excessive upon starting, and jump from 0 to a maximum. The initial current was about 30 amperes and gradually increased as each successive resistance notch was cut out and reached as high as 110 amperes. The higher current was not reached until the car was running on the higher speeds and steeper grades. The average current was 60 amperes, or five amperes less than the full-load current.

It is my opinion that the induction-motor will be the one used on most of the mine-hoists in the future, but that it is a little better adapted to inclined shafts than to the vertical, as there is a certain amount of slack in the rope or cable and the motor has a chance to start under small loads, thus doing away with a more sudden rush of current on the line. With a proper controller and resistances for primary and secondary, and a design suited for this particular load, there should be no reason why this motor should not be adapted to any hoist up to 200 h.p. at least. Of course, it is understood that where large induction-motor hoists are used and other apparatus and lights are run from the same plant, the main plant must be of large enough capacity to take care of peak loads; also the power-wires should be of ample size for a maximum load so as not to cause a drop in voltage due to higher currents.

CONCERNING bismuth, 'The Mineral Resources' of the United States for 1904 says: "The demand for metallic bismuth and bismuth compounds is small, though the quantity of metal which could be placed on the market is relatively large. For several years past the production and prices of bismuth and its manufactured compounds have been controlled by Johnson, Matthey & Co., of England, and the government of Saxony. The market is limited and the available supply greatly exceeds the demand." A reduction in the price would probably not be followed by a proportionate increase in the use of the metal. Its chief use is in making alloys which melt at a low temperature. Thus the alloy known as Wood's metal, consisting of tin 1, cadmium 1, lead 2, bismuth 4, melts at 60.5 degrees C., and Rose's metal made of tin one part, lead 1 and bismuth 2, fuses at 94 degrees C. These alloys are used for safety plugs in boilers and in automatic fire-alarms, etc.

THE King's road is the straight path of painful observation and experiment, and few there be that enter therein.

Drift Mining by Shaft.

Written for the MINING AND SCIENTIFIC PRESS
By D'ARCY WEATHERBE.

Mining gold-bearing gravel by the drift method originated in California in 1851, at Brown's Bar, on the Middle Fork of the American river, and in the following years it was applied to the old gravel channels at Forest Hill, in Placer county. The practice consists in following the *ancient* and *recent* river channels, now overlaid by unproductive alluvium and often by lava, into the hillside by means of adits and branch drifts, or by sinking shafts to the pay stratum and working it in the same manner by drifts and cross-cuts.

On Little Butte creek, near Magalia, in Butte county, the Perschbacher mine had in 1888 produced over $1,000,000. It was originally opened by an adit 800 ft. long and an incline to the lowest workings 250 ft., vertically, from the end of the adit. Later, in 1895, it was opened by a vertical shaft 502 ft. deep. This was 5 by 10 ft. in section—double compartment—and was sunk through lava conglomerate, wash, and basalt. It was timbered with 8 by 8-in. plates and lagged tightly with planking. There was a heavy flow of water and as the seepage from the old workings had also to be disposed of, the pumping plant included a compound differential plunger and a compound duplex pump each with a capacity of 500 gal. per min.; a Worthington 8½-in. plunger lifting 100 gal. per min. and three relay pumps, a Dow sinker and two Hooker pumps. Two 60-h.p. boilers supplied steam for the pumps, and an air compressor, run by water-power, was installed for the machine-drills. The gravel 'lead' is stated in the Twelfth Report of the California Bureau of Mines to have averaged only from 4 to 20 ft. in width and I believe it did not exceed 5 or 6 ft. in thickness. A former manager told me that though it was extremely rich in parts, the total gravel removed did not average over $2 to $2.50 per ton.



Fig. 1 The Blue Ravine Drift Mine.

The Hidden Treasure drift mine in Placer county is the largest example of this work in the State of California, if not in the world. This mine was opened about 1878 and has been working continuously since that date. The channel varies in width from 400 to 1,300 ft., and in 1896, 1,000 ft. of it had been worked. An adit of 8,000 ft. in the rock gave access to the mine and large amounts of timber were used. Some years ago the timber account was about $1,000 per month. The gravel is not cemented and does not need crushing. It contains from $1.25 to $1.50 per ton and costs about 90c. per ton to extract.

Often the inflow of water in these gravel mines is so heavy as to prevent operations altogether unless natural facility is offered for the opening of a drainage adit below the lowest part of the channel or the pay-stratum.

I give the above notes simply to point out the fact that gravel mining by the shaft method is not altogether the inconsequentia and hand-to-mouth operation that many lode miners, who have not had experience in placer camps, imagine. Experienced management, of course, is necessary to bring the average proposition to a successful issue. Ore—represented by gravel—averaging from $1.50 to $3.50 per cu. yd. of about 3,000 lb., or, say, $1 to $2.30 per ton, is, and has been, worked at a profit where only the facilities of an average lode mine are available. It is true that often the expense of blasting, machine-drills, and milling apparatus are eliminated, the gravel being handled automatically by water, but in some cases it has been necessary, as at the Perschbacher mine, to use both powder and machine-drills and in other cases (for instance where a cemented gravel is encountered), an arrastra, stamp-mill, or other pulverizing machine is necessary to disintegrate and crush the material before sluicing.

Until recently no method except the application of experience and 'horse sense' was employed as an expedient for prospecting in unknown ground or in seeking lost channels. Large amounts of money have been sunk in this work and occasionally long adits have been driven only to find that the ground is unprofitable or that the channel has turned. The days of the mine manager who only employs the so-called 'horse sense' method—which by the way is often a misnomer and stands for 'nonsense'—are past, and to-day careful surveys are made and scientific prospecting by shaft or drill-hole is done before attempting to work a placer property. In one large alluvial district, I am aware of over 4,000 holes (by drill and shaft) averaging over 25 ft. deep, having been sunk on a limited area. In Bowie's book on hydraulicking he speaks of "a remarkable instance of the extent to which preliminary work has been carried on." In the so-called "remarkable instance" it appears that only four shafts were sunk to prove what afterward turned out to be the largest hydraulic working in the State—a case of good luck. At the present time an experienced placer-mining engineer would stand aghast at the proposal to expend large capital on such a basis. In the subsequent description it is proposed to give a sketch of the present work being done in the Blue Ravine channel and the methods employed there in mining and gold recovery.

A few miles above the town of Folsom on the American river some old open-cut or ground-sluicing operations disclosed, years ago, an ancient channel flowing southerly and almost at right angles to the present river. It appears that this channel, for some distance at any rate, skirts the low hills at the base of the foot-hill region. The surface of the ground drops in the direction of the flow at about an equal gradient to the bed of the channel, which lies from 60 to 80 ft. below the present surface. During the last nine years several mines have been opened between the river and the Blue Ravine workings of today and a large amount of gold has been extracted. The Gray Wing and the Old Blue Ravine mine were the most promising pits and some of the gravel is said to have carried between

$400 and $500 per cu. yd. The width of the channel varies greatly. For some distance between the Gray Wing mine and the Old Blue Ravine workings, the pay ground was only eight feet wide and in other places it exceeded 200 ft. Much of the bench-gravel was too low grade to work.

The present Blue Ravine workings were opened in October, 1905, after prospecting by bore-holes put down with a Keystone drill which traced the channel from the old mines south; two shafts further to the southeast failed, it is said, to discover the continuation of the pay-gravel. The direction of flow of these old streams is determined locally in prospecting shafts or bank exposures by the grade of the bedrock upon which the pay-stratum lies.



Fig. 2.

In case the gravel is in a layer higher up and separated from the bedrock, its direction is told at a glance by the manner in which the smooth boulders and pebbles are deposited, overlapping one another or shinglewise, and tilted up with the higher end down stream. This is characteristic of most channel-gravel and as a rule ground in which the stones are erratically deposited is not so rich. To determine the grade, however, the bedrock would have to be uncovered for some distance. Fig. 2 shows the way the rocks lie in their matrix of clay, sand, or soil; the arrow on the sketch and the pitch of the bedrock surface denote the direction of the current that formed the deposit. In this figure the bedrock is a schist, the jagged edges of which, being pointed up-stream, form natural riffles.

Finely laminated slate with quartz seams forms good natural riffles for the segregation of the gold. The nuggets and scales frequently become imbedded to such a depth that it is found profitable to excavate the top portion of the bedrock for a depth of several feet.

Fig. 3 is a typical section, north and south, across a block of the foothill country on the lower west slope of the Sierra Nevada and illustrates two ancient river-channels formed in successive ages and at different levels.

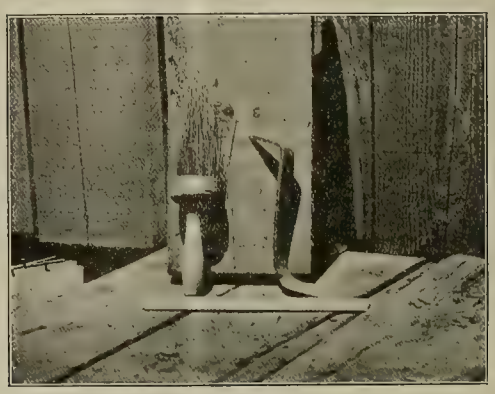


Fig. 5.

Referring to Channel A, an adit has been driven from the eroded canyon through the rim-rock to the gravel, which it drains and through which it can be worked. In the lower part of the sketch is a longitudinal section, east and west, following the course of Channel A from the face of the hill above the valley back to where it has been eroded by a north and south ravine. At the right of the sketch may be seen its continuation through a higher hill. In this figure is shown another method which, when the natural facilities allow it to be adopted, is most advantageous. Here the adit has been driven up the slope of

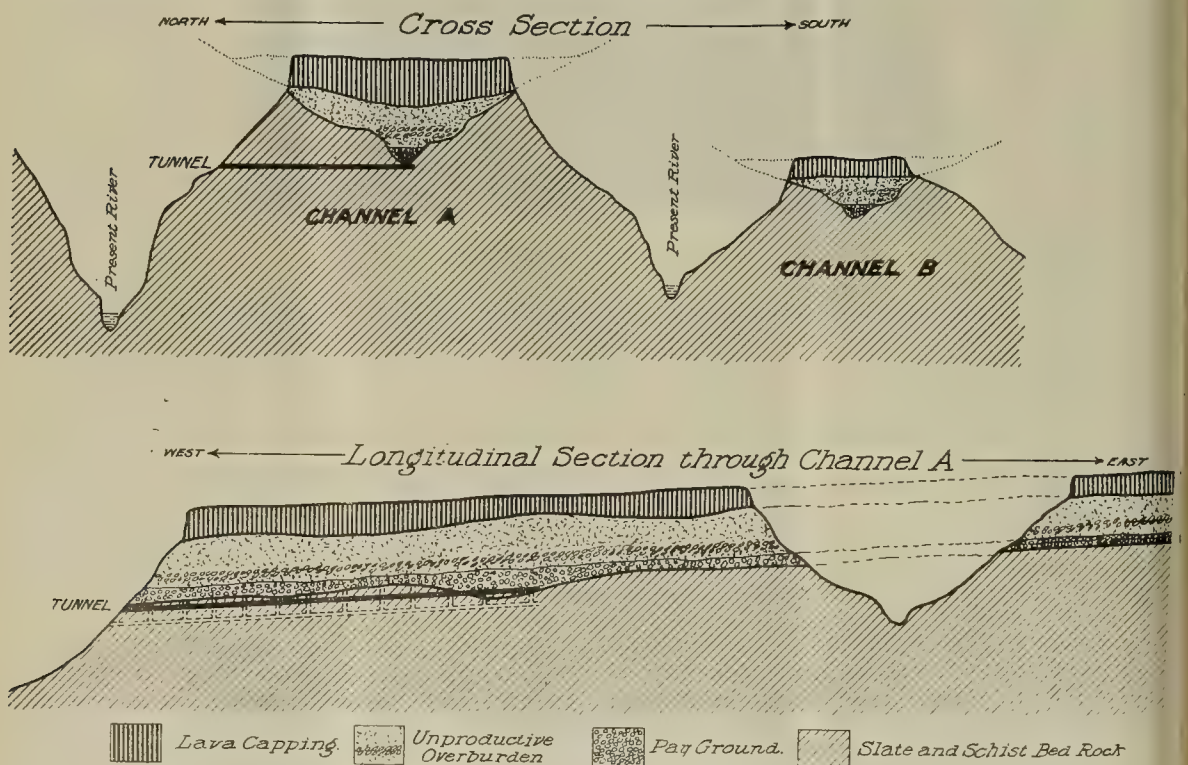


Fig. 3.

the channel and partly in the bedrock; drainage and grade for handling the gravel are afforded from the start. An alternative method might be adopted here by driving a drainage adit in the rock below the working level, connecting them by a series of raises; these would act as chutes, the gravel being dropped down and sluiced to the mouth either by the contained water or by a supply that could be brought from the outside. A riffle or gold-saving system could be placed in the lower adit. Many other variations of this system of mining by adits could be illustrated were space available.] In the following account, however, is described the more expensive method, by shaft, drift, and crosscuts, when the channel is found to continue below the flat land of the valley. This is the method adopted at the New Blue Ravine mine.

The shaft passed through the pay-ground just before reaching bedrock, at 63 ft. It was sunk in the rock for a further distance of 31 ft., a total of 94 ft. from surface. At 82 ft. from surface a drift has been made through the rim-rock for about 120 ft. where the gravel is again cut at a point near the bottom of channel, so that the drift will drain the mine above this level. The shaft is divided into three compartments—a skip-way, pump-way and a ladder-way; the skip-way, which is in the centre, is 4 by 5 ft., the pump-way and ladder-way are each 4 ft. 4 in. by 5 ft. The plate-timbers forming the sets are 8 by 8 in. and the latter are placed at a distance of 5 ft. 4 in. vertically between centres, the usual posts being used. The dividers are 4 by 8 in. and the shaft is tightly lagged vertically with plank 2 by 8 in. The channel at this point is about 200 ft. wide and the method of working is as follows, though, of course, under certain conditions such as the narrowing of the channel, encountering poor ground, etc., it has to be modified. The pay-stratum varies in thickness from 18 in. to 3 ft. It lies on the bedrock and also varies in tightness—no machine-drills are used—and in places it can be broken with a pick without the use of powder. A 'main' or 'working drift' (Fig. 4) 5 ft. wide at bottom and 5½ ft. high, inside timbers, is driven approximately along the channel and on the grade of the bottom. At 100-ft intervals in the 'main drift,' crosscuts called 'breast-drifts' are carried to the limit of the pay-ground. These are 8 ft. wide outside timbering. With the main drift and limit of pay-ground as boundaries, there is enclosed a panel as illustrated in Fig. 4. Commencing simultaneously at the ends of two adjacent breast-drifts, three 'breasts' or working places are broken out from each drift and pushed ahead to meet each other in the centre of the panel. The centre breasts—a, a, in the worked-out portion and c, c, in the portion being worked—are kept slightly ahead of the breasts on each side (b, b, b, b, in the worked-out portion and d, d, d, d, in the

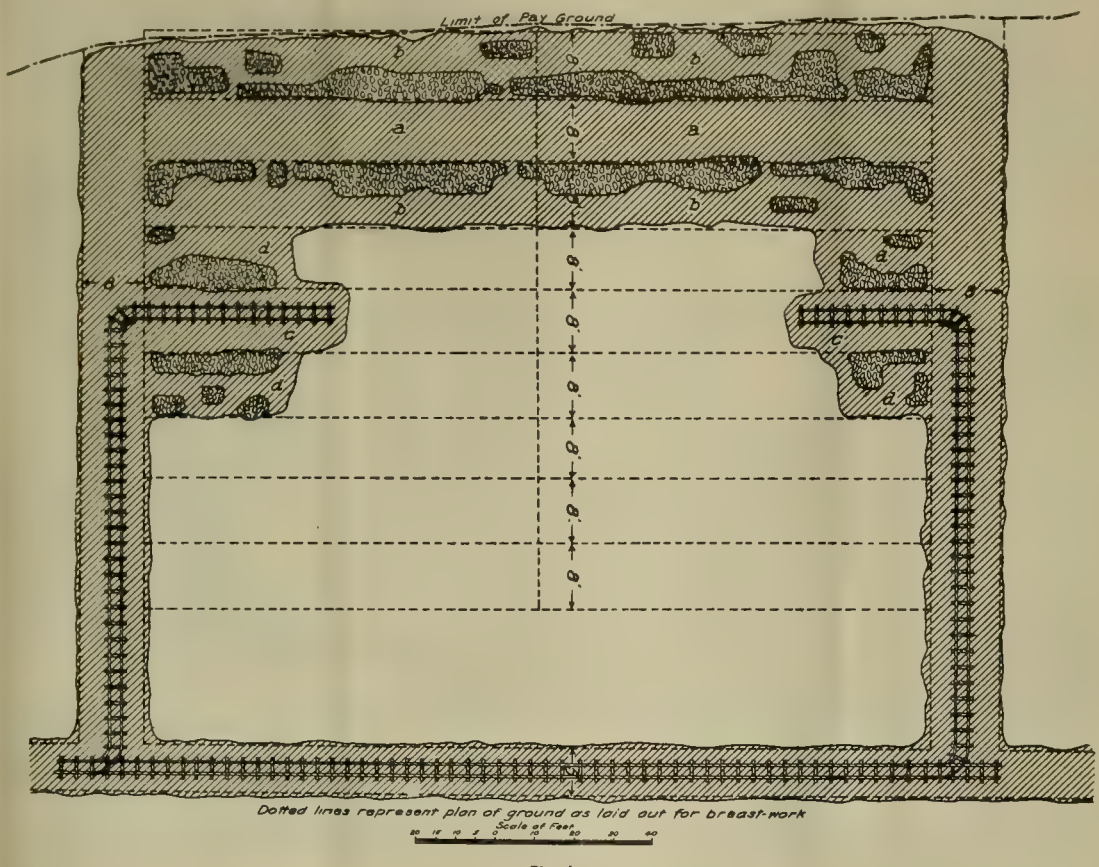


Fig. 4.

ground being worked)—and the track is laid in the centre breast. When the three breasts from each breast-drift meet in the centre, the track is pulled up and the bedrock washed, scraped, and brushed, and as much timber as possible is drawn quickly. Fig. 5 shows the scraper and brush. The former is a home-made tool, fashioned from an old file or bit of steel, one end being flat and sharply pointed and the other spoon-shaped. The brush has long wire bristles, and with these the cracks and small fissures in the rock are cleaned, for any possible gold.

Three other drifts are then started from each side and the work is carried on in this way until the 'main drift' pillar is reached. Formerly, in many drift mines it was attempted, by leaving pillars and placing a forest of timber, to hold up the roof throughout the workings; but the method here and elsewhere employed today is much more sensible and consists in letting the roof above the worked ground cave, and thus relieve the tremendous

pressure created by the weight of a heavy body of overlying material possessing little cohesion. The bedrock immediately below the gravel is generally loose and full of crevices; the loose portion is taken up and, with the boulders from the gravel, is stacked along the 'breasts'; this is necessary because an opening 24 ft. wide has to be kept intact while working. A pillar is generally left along the side of the 'main drift.' The finer material is loaded into cars holding about half a cubic yard and is passed from these through a chute into the lower or rock tunnel. From here cars, holding ¾ ton, discharge into the skip, which has a capacity of one ton.

(To be continued.)

WEIGHT TABLE FOR STANDARD CAST-IRON PIPE.—The accompanying table was compiled by G. B. Zahniser for *The Engineering News*. As may be seen, it gives the weights per 12-ft. lengths of 4 to 72-in. standard cast-iron pipe, and also factors, in the third column, for ascertaining the weight in tons of any length of, and size of, standard pipe by a single multiplication. Mr. Zahniser suggests that similar tables can be readily computed for light and extra heavy pipe.

To Reduce any Length of Standard Weight Cast Pipe to Tons (2,000 lb.)

Diameter pipe, in.	Weight per 12-ft. length.	Multiply total length of pipe by
4	264	.011
6	396	.0165
8	504	.021
10	720	.03
12	900	.0375
14	1,200	.05
16	1,500	.0625
18	2,004	.0835
20	2,400	.1
24	3,000	.125
30	4,008	.167
36	5,400	.225
42	7,200	.3
48	8,700	.3625
60	12,900	.5375
72	18,720	.78

ARSENIC, CARBONIC AND SULPHURIC ACID, and some other minerals in solution in battery water, will usually interfere with amalgamation inside and outside the mortar. Plates become hard from various causes—chiefly from lack of sufficient gold to form a fair coating of amalgam over their surface. When low-grade rock is run the usual practice is to scrape the plates closely in order to obtain a good clean-up. This is directly the opposite of what should be done, for there is no surface calculated to catch gold like gold-amalgam itself, and where the ore is low grade, or only contains a little free, amalgamable gold, a good coating of amalgam should be allowed to accumulate on the plates, which should be cleaned up with nothing harder than the rubbers made for this purpose. The plates should never be touched with a steel chisel or scraper until ready to abandon the mine or mill. Nor is anything actually gained by the periodical sweating of the plates by pouring scalding water on gunny sacks or blankets spread over them, nor in heating them by piling on their upper surface hot sand to soften the amalgam. Such schemes are only justified at the time of a final clean-up, or when it is considered necessary to re-plate the copper plates with silver. The use of too much cyanide of potassium, or its continued use in small amounts is detrimental to plates. If battery water is too warm it will have the effect of softening the mercury, when it will run off the inclined surface of the plates in small globules. The temperature of the water may be cooled by first delivering it to a cooling-tower provided with screens at various heights through which the water falls in a shower, the temperature being in this manner reduced to a proper degree. Experiments made at the Homestake mine at Lead, South Dakota, proved the best temperature for the most successful amalgamation there was at 52 degrees F.; that above or below this temperature the loss increased somewhat.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The black rock from Taxco, Mex., is Diorite-aphanite.

The rocks from Brownell, Ariz., are: No. 1, Feldspar-porphyry; No. 2 is composed almost wholly of Feldspar and Hornblende, both are much altered, but the rock was probably originally Syenite; No. 3 is Hornblende-schist; No. 4 is similar to No. 3, but more altered, the feldspar being much kaolinized.

The samples from Ketchikan, Alaska, are the following; No. 1, Pyrrhotite, mono-sulphide of iron (magnetic). It may contain gold, silver, nickel or cobalt—any, all or neither of them; No. 2, Pyrite and Galena in Quartz, probably gold and silver-bearing; No. 3, Sericite-schist containing pyrrhotite and iron oxide; No. 4, Hornblende-schist containing much pyrrhotite. There is also a large amount of epidote present, the result of alteration of the hornblende.

The rocks from Whelan, Montana, are: No. 1, Chalcopyrite with stains of blue and green copper carbonate in a gangue of Dolomite, with grains of disseminated quartz; No. 2, mostly Dolomite, the brown earthy mineral is iron oxide; No. 3, Quartz with scattered chalcopyrite (copper sulphide); No. 4, Dolomite with copper sulphide. One piece is mostly iron oxide; No. 5, Dolomite—one piece shows a little copper-glance; No. 6, Dolomite and iron carbonate (the dark brown streak). The sulphide mineral is chalcopyrite and bornite; No. 7, two pieces—buff and red—both carbonate of lime; No. 8 is lime rock. The slaty structure is due to pressure, for the lines of sedimentation can be distinctly seen crossing the slaty cleavage. The white mineral on one side of the rock is crystallized calcium carbonate. The geological age of a rock is not usually material so long as it contains mineral veins or ore deposits. Whether No. 8 is of Cambrian age or not, is impossible to tell from the specimen. The ore accompanying these samples is chiefly chalcopyrite. The small green piece consists of carbonate with a little glance.

A SYNDICATE of Pittsburg capitalists is reported to have taken steps to develop a large deposit of vanadium ore under a concession from the Peruvian government. Joseph M. Flannery is secretary of the company. Vanadium melts at a high temperature, and has been introduced in small quantities in the manufacture of iron and steel, giving an alloy said to be of remarkable strength, resistance, and toughness—to such a degree as to make practicable the manufacture of armor plate and projectiles at one-half the customary weight.

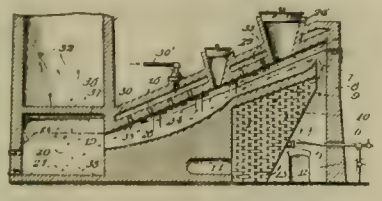
ARASTRAS, or drag-stone mills, are but little used in British Columbia. There are a few, though, for the gold commissioner of Lillooet mentions the existence of two in that mining section. Under the head of 'Mineral Claims' he reports: Very little development work, other than the usual assessments, has been done on many quartz veins in the district, with the exception of the Lorne mine at Cadwallader Creek, where in 1905 four men were engaged extending the tunnel 24 ft. and crushing 133 tons of ore, in an arastra, which yielded $2,000. Another arastra was completed late in the season for the Pioneer claim, also situated at Cadwallader Creek. The manager had only time to crush three tons of ore, which he states, yielded $150, before being compelled to stop operations on account of frost.—British Columbia *Mining Record.*

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

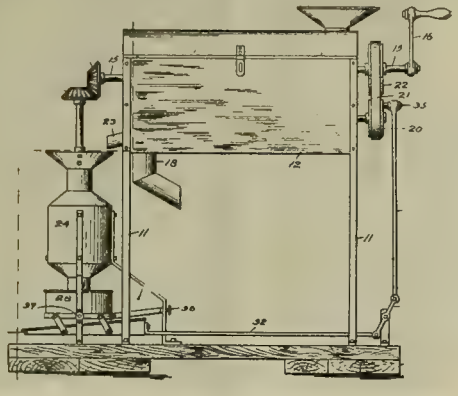
SMELTING FURNACE.—No. 824,383; John D. Rivard, Los Angeles, Cal.

In a smelting-furnace; an inclined chamber; a combustion-chamber below the higher end of said inclined chamber and having the throat thereof opening into the higher end of said inclined chamber; means to supply ore into the higher end of said inclined chamber; a stack at the lower end of said inclined chamber; a crucible in the bottom of said stack, and means to supply downwardly-directed blasts of hot gas into said inclined chamber upon the ore passing therethrough.



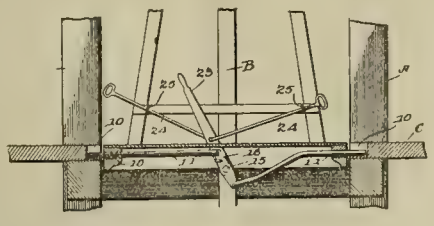
MERCURIAL AMALGAMATOR.—No. 823,577; Barlow Baldwin, Chicago, Illinois.

In a mercurial amalgamator, in combination, a tank for the mercury, a hopper for dry auriferous material, a spout extending from said hopper into said tank, and a conveyor adapted to drive the aforesaid material into and through said spout without clogging thereof, and a nearly plane horizontal distributer adapted to spread said material over the bottom of said tank without agitative stirring of the mercury.



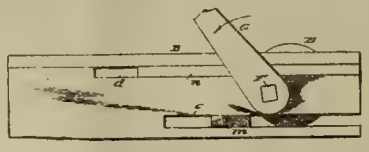
MINE-CAGE—No. 824,269; Frank N. Wilson, Cripple Creek, Colorado.

In combination, a cage-platform having side or edge members provided with guiding-openings, a rock-shaft journaled below the platform, a pair of levers secured to the rock-shaft, and each having arms projecting in opposite directions from the shaft, longitudinally movable chair members having their inner ends pivotally connected to said arms, and the outer ends extending through the guiding-openings, a lever secured to the shaft and extending up through an opening in the platform, a torsion-spring arranged on the rock-shaft and tending to turn the same to effect withdrawal of the chair members, and a pair of handled rods guided by the cage and extending from the lever to points adjacent the opposite sides of said cage.



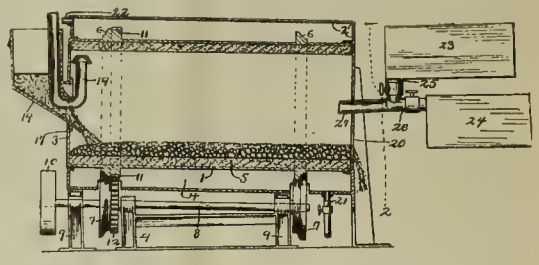
DRILL SHARPENER.—No. 822,906; Clarence W. Atkinson, Jamestown, Colorado.

In a drill-sharpener, the combination with a casing, having an opening in its top and also having lower and upper, longitudinal guideways in its side walls, a die member fixed in the casing and comprising an end abutment the inner side of which is concave in cross-section and is inclined upwardly and inwardly and a portion extending inwardly from said abutment and having a channel, of V shape in cross-section, in its upper side, and a die member movable in the casing toward and from the abutment of the first-mentioned member and having an upwardly and inwardly inclined inner end, of concave form in cross-section, and also having a lower forward portion, of V shape in cross-section arranged to move in the channel of the first-mentioned member, and also having cross-heads movable in the lower and upper, longitudinal guideways of the casing; of an eccentric cam mounted between the side walls of the casing and arranged when rotated to move the second-mentioned die member inwardly, and a lever fixed with respect to the said electric cam.



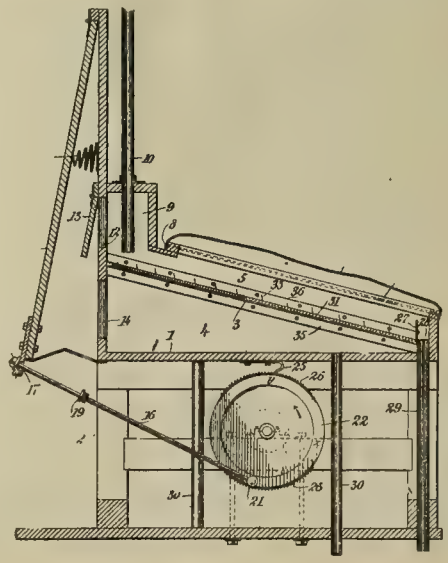
PROCESS FOR THE REDUCTION OF ORES.—No. 824,663; W. Koehler, Cleveland, Ohio.

The process of treating ores which consists in subjecting them to the action of gaseous hydrochloric acid in presence of an oxidizing agent.



JIG OR ORE-CONCENTRATOR.—No. 824,623; Alonzo C. Campbell, Asheville, North Carolina.

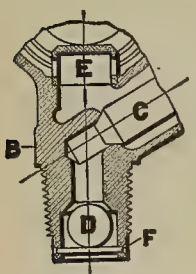
A concentrator or washer comprising a jig-box, a series of riffles arranged therein at a downward inclination toward the outlet end of the box, a flexible cover above the riffles, a dam at the lower end of the riffles, a receiver for material passing over the dam, a discharge leading from said receiver, discharging devices leading from the box, and means for causing the circulation of air through the box.



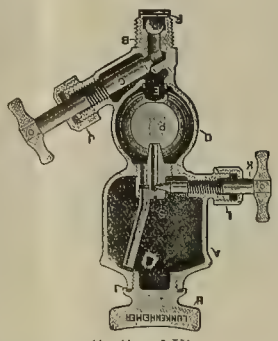
A New Lubricator.

Those interested in the lubrication of gas or gasoline engine cylinders will be interested in the Premier lubricator, which has been but recently placed on the market.

The cup is made of the highest grade of bronze composition, the construction is compact and the general design is good. The cup was constructed not only with a view to proper and positive lubrication, but also to withstand severe service. The filling hole is large, which users will appreciate, as it permits the use of a filling can having a large spout. Positively to insure a tight joint between the filling plug H, and top of cup, the plug is provided with a lead washer I, which material, being softer than the brass upon which it bears, will readily conform to any irregularity that might exist between these bearing surfaces. To permit of refilling the cup while the engine is running, the valve C has been provided, which can be quickly closed and opened. The stem of this valve is well packed by means of the stuffing-box J.



Detail Sectional View of Shank, Showing Ball Check D and Baffling Cap E.


Sectional View.

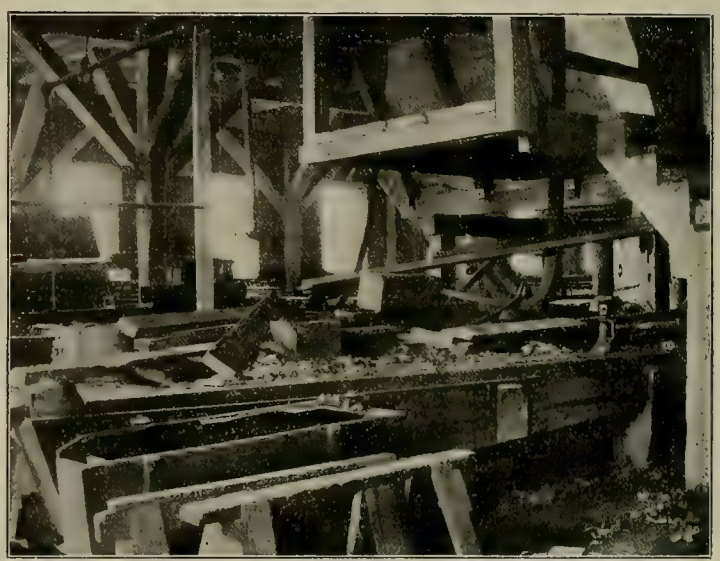
The regulation of the feed is accomplished by means of the valve K, provided with a fine needle point; the thread on the stem is also of fine pitch; hence a very close adjustment can be obtained. The stuffing-box L not only serves the purpose of preventing leakage around the stem-valve K, but by means of it the proper amount of friction can be brought to bear on the stem and prevent the unsetting of the valve. The object of the tube T, within the cup A, is to equalize the pressure on the oil, which permits the oil to drop by gravity through the sight-feed and thence to the cylinder.

To provide against the back pressure interfering with the proper formation of the drops in the sight-feed and causing the oil to spatter around the glass, the shank B of the cup is fitted with a large ball check-valve D. It has been found, however, that where the back pressure is unusually great, as in engines with worn piston rings, the ball check does not entirely remedy this trouble. To meet this condition, a baffling cap E has been provided above the valve C. The gases escaping past the ball-check D are effectually muffled and diffused by means of the cap E, and hence the drops form perfectly, drop freely and steadily, and the sight-feed glasses never fill up.

The Premier lubricator is manufactured only by the Lunkenheimer Company of Cincinnati, Ohio.

Why Some Machines Fail to Work.

The accompanying photograph shows, in the foreground, an old-style Wilfley table concerning which the foreman said: "She don't do much good; them tables on the other side do better." After removing the heavy roll of belting, jack-screw, timber, and other debris, it was not a great surprise to find that the application of a straight-edge proved the table-top to be somewhat bowed, in addition to showing many heavy boot-heel marks, broken riffles, a hole worn half through the top by a wash-water pipe which had been allowed to rest upon it, and holes worn through the bottom of the feed-launders. "Them tables on the other side" had metal frames and the tops had remained true in spite of hard usage. This example of carelessness comes to us from the Atlantic seaboard.


A Concentrating Table Badly Used.

Commercial Paragraphs.

THE ALLIS-CHALMERS' Denver office is now in the McPhee Bdg., and their El Paso office in the Guarantee Trust Building.

THROUGH their New York works, and temporary San Francisco plant, the PELTON WATER WHEEL Co. has been executing orders as usual, and has booked new orders which will enable it to run at full capacity for many months to come.

THE WELLMAN-SEAVER-MORGAN Co. of Cleveland, Ohio, reports a contract with the Cia de Real del Monte y Pachuca, Mexico, for a large order of electric hoists, consisting of six hoists with double reels 12 ft. 8 in. maximum diam., 18,800 lb. load, to use 4½ by ½ in. flat wire-rope and to hoist this load at a speed of 1,000 ft. per min. with air-operated post-brakes and auxiliary hand-brakes. Also six hoists with double reels 10 ft. 6 in. maximum diam. each to handle a load of 11,300 lb. at 500 ft. per min. to use flat rope 4½ by ⅝ in. with hand-operated post-brakes and one hoist with 36 by 48-in. double-drums, to handle a load of 8,600 lb. at 500 ft. per min. All the above hoists are to be equipped with three-phase, 440 volt, 50-cycle electric motors with master controller and water-cooled rheostats.

Publications Received.

THE DENVER, NORTHWESTERN & PACIFIC RAILWAY is the title of a handsome pamphlet, bound in linen, and well illustrated, describing the country through which the Moffat railroad passes, between its terminals at Denver and Salt Lake City. It has been prepared by a writer peculiarly well qualified—Mr. William Weston—one of the most capable of the exploring engineers that have helped to develop the resources of Colorado. The book or pamphlet contains valuable articles on the geological features of the coal and metal-mining tracts crossed by this railroad, and charming descriptions of the fish and game to be found in its rivers and amid its picturesque scenery. Several maps add to the usefulness of the publication.

A 'VOUSSOIR' (pronounced voo-swor) is one of the wedge-shaped stones which form an arch. The middle one is called the 'keystone.'

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Editorial.

WE TAKE the opportunity of extending a courtesy to two friends.

Mr. Robert Sticht, the distinguished metallurgist, now at Mt. Lyell, Tasmania, who is a keen student and practician of pyrite smelting, wants copies of the MINING AND SCIENTIFIC PRESS published before 1900 containing articles on, or references to, pyrite smelting.

The assay-office of the Selby Smelting & Lead Co. is now at the works, instead of in this city, as formerly. The company used to make custom assays; this has been discontinued. It is desired to make the fact known.

IT IS AMUSING to note that stock-market reports credit Mr. Corey's domestic scandal with depreciating quotations of United States Steel common shares. The great Steel Corporation has had two presidents who have lost their moral equilibrium by reason of excessive wealth; the suddenly rich of Pittsburg are making a sad spectacle of themselves and illustrate the fact that they are an accidental sort of people, unfit for responsibility. They remind one of those who, accustomed to driving an express wagon, undertake to manage a motor-car, the high speed of which is exciting, until going faster than they are aware, they lose control and pitch into a ditch, to the relief of those on the highway, who are endangered by their performances.

ANOTHER PHENOMENAL STRIKE is announced in Nevada, in the desert known as the Granite Springs valley, lying west of Lovelocks, and a stampede is said to be in progress. A local paper, deprecating reports which tend to give such announcements the inflated appearance of a boom, modestly says that the ore from the new strike contains by assay $67,000 gold per ton, and $17,000 silver. The conservatism of this announcement will be realized when it is remembered that at 65 cents per ounce, solid silver is worth only $18,957 per ton, making the ore 90 per cent silver; if the remaining 10 per cent be gold, it would add about $60,000 to its value, but in some unaccountable manner an additional $7,000 per ton has infiltrated into this phenomenal ore, probably by secondary enrichment from above. It is also stated by our Nevada contemporary that this vein, in compensation for its unusual richness, is only four inches wide; nevertheless two townsites have already been started in the vicinity of the new mines.

ENGLISHMEN are not irrigating the waste places of the earth with capital in these days as they did afore-time. London feels gloomy, and it is fortunate for the mining of the useful metals in North America that financial support is forthcoming from cities on this side of the Atlantic. The depreciation in the market value of mining shares at London during the last six or seven month

amounts to at least $500,000,000, and if it had not come on top of a slow liquidation, unaccompanied by speculation, the result would have been more emphasized. Consols have gone to a new low level and Rand Mines, the barometer of South African finance, have been to nearly £5 from their former high record of £13¾. The unpleasant factors are various; there is the general financial uncertainty due to Russian misgovernment, the disturbance to cash balances caused by the San Francisco conflagration, and the uneasiness in South Africa over the native uprising in Natal. A direct influence in the liquidation of mining shares is found, of course, in the political squabbles over the Chinese on the Rand, with the probability that when the Transvaal gets constitutional government next year, the first step will be total repatriation of the coolies and a sudden curtailment in the local labor supply. That prospect has made the Kaffir market ill. Unfortunately, the effect is the worse by reason of the uncertainty regarding future events, in which statesmanship and high finance will play a fateful part. It is not likely that the mining market at London will recover any of the delightful irresponsibility of boom days until these dark clouds have passed or precipitated their burden of final liquidation. Meanwhile money is accumulating and new reserves are being created for the time when the financial skies become clear once more.

Government Ownership of Coal Mines.

This question has been much discussed in a quiet way in coal mining circles this spring and summer. Senator La Follette's suggestion, with which the President is said to be in entire accord, that the remaining coal and oil lands of the public domain be segregated and reserved from sale, is attracting attention. When, prior to the allotment of lands in the Indian Territory, the coal lands were surveyed and appraised, their value was estimated by the Government agents at much more than the operators of the region were willing to pay. The first advertisement for proposals accordingly fell flat, and when after long negotiations a set of leases covering much of the land was presented to Congress for ratification, Mr. La Follette protested that the terms were radically unfair to the Indians and the Govern to ment.

That coal land, as also farming land, timber land and mineral land, have been obtained in the past from the Government at nominal prices for speculative purposes, is too well known to permit of denial. Frequently it has been obtained by devices which were at least technically illegal, though sanctioned by custom. Apparently in coal-land as in timber-land cases we have come to a new point of view, and public opinion is ready to demand a stricter compliance with the law and, for the Government, a larger share of the speculative value. To this extent the proposition to reserve such lands temporarily from entry until they can be studied and appraised will probably command public support, despite the fact that Congress refused to direct that it be done. It is reported that President Roosevelt believes he has authority to warrant such action under general laws, and some such action may be anticipated. This, of course, will only directly affect areas in which mining is now going on, but since most Western coal mining is inextricably mixed with Western railroading, Chicago is particularly interested.

There is, however, another aspect of the case of which a much less favorable view is taken. It is believed that both President Roosevelt and Senator La Follette have in mind steps looking toward actual Government control of mines and oil-wells on public lands. It was currently reported during the last strike that if matters became serious, the President stood ready to seize certain mines and "operate them for the benefit of the public." Just how much truth there is back of this belief no one can say, but any move toward Government operation of mines will excite opposition from men familiar with the situation.

The arguments advanced to support the move are curiously like those which almost exactly a century ago led to the trial of Government ownership of the lead mines of the Mississippi valley. In 1807 the big mining region of 'the West' was in Wisconsin, Iowa, Illinois, Missouri, and the new territory of Arkansas. The Missouri deposits were covered by old Spanish and French land grants, but the others were on public lands. These were reserved from sale and placed under a mining superintendent, so that there might always be lead for the army, so that there might be no extortion, and to secure revenue. The Government did not attempt actual mining, but leased the ground in small lots on a royalty basis. The system never worked very well, and in 1846 it was abandoned. It had become apparent in the meanwhile that the army was not likely to suffer for want of lead, the people in the areas affected protested that the leasing system retarded the development of the country, and the revenue proved disappointing. It cost $68,464.50 to collect $145,174.40, aside from heavy expenses in the courts.

It seems likely that much the same difficulties would be encountered in any attempt to put into effect a similar system of coal or oil leases. At first glance it is not clear why the Government as a land-owner would be at any serious disadvantage in leasing its mineral lands. Possibly, if it confined itself to the same sort of a lease as is given by individual land-owners, a working scheme might be evolved. It would, however, be almost inevitably forced out of such a position, and, indeed, it has been plainly stated that one purpose of the move is to prevent the arbitrary action of a coal monopoly. To do this it would be necessary to go into actual coal mining, since mines cannot be opened and working forces organized to meet sudden emergencies. Operators could not afford to open and equip mines on Government land or elsewhere except on terms which left them the largest possible freedom of action. As a matter of fact very few mines are now being opened except on land owned by the mining company, and the leasing system in the coalfields of the Middle West is dying a natural death. The plain truth is that there are now more mines open than can work to anything like full capacity, and any monopoly of bituminous coal mining which raised the profits would lead to many more being opened. Such control as is exercised, is in the transportation of the coal. When one studies the present unsatisfactory condition of coal mining with its pecu-

liarly close relations to railroads and its large dependence on union labor, it needs no cry of socialism to make one distrust the wisdom of the Government entering the field. It is perhaps significant that the Prussian Government, even after buying heavily of the stocks of the great Hibernian company, decided it was better to be a minority stockholder than a coal-mine operator.

In general, the effects of the long contested strike in Illinois have disappeared. The mines are running much as usual, perhaps a little heavier than usual. So much coal had been stored against the strike that there was no extravagant demand upon resumption. According to figures just published by the State Geological Survey the output for the calendar year 1905 was 38,081,674 tons, valued at $39,754,071. The Bureau of Labor Statistics gave the output for the fiscal year ending June 30, 1905, as 37,183,374, valued at $38,689,858. In each case comparisons with the corresponding figures for the preceding year show an increase in tonnage with a decrease in value.

One of the interesting results of the strike settlement is that the operators now have a defense against local strikes. It has been a matter of contract here for some time that in case of local dispute the men were to continue at work pending adjustment of the difficulty by the State officers. Nevertheless there were many brief, but annoying local strikes. Under the new agreement a fine of $10 per man is assessed in such cases, half going to the State treasury of the union, and half to the operators association. At the Donk Bros. mine not long since two mule-drivers were discharged, and without waiting any adjustment of the difficulty 400 men quit work. They are now just $4,000 poorer than they were before they tried the experiment, and are not likely to quit again without previously observing the rules of the game.

Who is a Mining Engineer?

A mining engineer of high reputation writes to us this week making an onslaught on quacks and that large army of charlatans which masquerade in the clothes of an honest occupation. This is well enough; it is safe to castigate such frauds once in a while, on the principle of the small boy who shouted to his pal, engaged in a tussle, "Give him what for, he ain't got no friends!" We quite agree as to the harm done by make-believe mining engineers. It seems almost a pity that we have not got an organization analogous to the bar association of our sister profession, able to stamp the men in proper standing and capable of stigmatizing those who go wrong. That will come in the Greek kalends. Meanwhile who is to be the judge? Not we, and certainly not any individual engineer. It is difficult to arrive at a basis for agreement, because motive plays a part in determining the character of a deed. An innocent ignoramus who thinks himself qualified to pass on mining matters, may make his blunders in the best of good faith; is he then any worse than the skilful geologist who appraises a mine without any experience for such work or the otherwise honest mining engineer who advises on the metallurgical treatment of an ore without any qualifications in that department of knowledge? We have met many charlatans in the tented fields of Western Australia, for example, and the worst deeds were perpetrated by men who had an experience of other kinds of mining under more favorable conditions and were misled more by enthusiasm than deviltry. Some of the reports that caused the biggest loss of capital were by men fully qualified in an academic way, but lacking in common sense and in the ability to understand the dependence of profitable mining upon favorable economic conditions. It takes something besides gold ore to make a gold mine. Another point of disagreement is worthy of mention. It is suggested that only the man who has his degree as mining engineer is qualified to append the designation to his name. To this we demur strongly. If the initials M. E. are to be set aside for those who have obtained the degree of 'mining engineer,' well enough, but incidentally it may be pointed out that several schools of mines authorize their graduates to use E. M.—'Engineer of Mines'—and one school, with a royal name and a bourgeois endowment, calls its men 'Associates.' This is a minor point, but the fact remains that the degree indicates merely an academic instruction which is the preliminary to the practical training that makes a mining engineer. Many men with a luminous tail appended to their name never do become real mining engineers; they remain to their life's end the simulacrum of the real thing. On the other hand, some of the very best men on the active list of the profession today have had no academic instruction; they went to work after a common school education and yet have qualified themselves for positions of great responsibility. They have become excellent engineers by a less direct path, that is all. The mental training involved in a course at college should enable a man to think more logically and to get at the heart of a problem more quickly; a school-of-mines man ought to get ahead of a contemporary who went to work without a scientific preparation, simply because he has the start of the other fellow. Whether he retains that advantage depends on the individual himself, not on the preliminaries of his life. When it comes to the labeling of those engaged in mining, we do not hesitate to say that a man who for several years has had charge of mines, surveyed them, sampled them, and advised clients in the purchase of them, is a mining engineer—more of a mining engineer, indeed, than the green graduate from the best school of mines. The confusion in the use of the name and the denial of it to others is due to the assumption that one kind of knowledge makes a complete equipment for practice. It is not so; to the academic must be added the practical—that is to say, to the information of the library must be wedded the experience of life, in the office, in the mill, and in the mine most of all. The ideal mining engineer is he who, with faculties made alert by the gymnastics of the class-room, has acquired the judgment and the sense of proportion that come from actual mining operations, who balances the ideal and the real so as to make the best of the realities of every-day work—the particular purpose of which is to be able to advise his clients how to make money—honestly.

Special Correspondence.

LONDON, July 18.

Diligent advertising of Penn-Wyoming Copper has evoked some interest in the company on the London market. A public issue of 400,000 shares of $5 each having been made on this side, a meeting has been held here to enable the European shareholders to meet the president (Mr. E. M. Cobb) and the general manager (Mr. Norton). The following particulars are gleaned from a lengthy report of the meeting:

The Penn-Wyoming Copper Co. was incorporated in 1904 for the purpose of taking over the smelting works at Encampment, also the tramway, which cost about £85,000, and the Ferris-Haggerty mine, with all the pipe-lines, the Transportation Co., the Town Lot Co., and so on. By taking over these companies, and bringing them all under one management and organization, the Penn-Wyoming Co. is to receive the profit from every concern that has any connection with the mining, from the time the ore is broken in the mine until the copper is delivered to the railroad. The registered capital is $10,000,000, of which $6,000,000 has been issued in America, mostly among the directors and their immediate relatives and friends. The property is in the State of Wyoming, in Carbon county. The town of Encampment, where the smelting works are situated, is 46 miles below Walcott, on the Union Pacific Railroad. The company's tramway connecting the district with the smelter is the longest aerial tramway in the world—16 miles long. The 972 cars, or buckets, hold 800 lb. each. The altitude of the highest point in the mountain range reached by the tramway after leaving the smelter is nearly 5,000 ft. above the smelter. The high-grade ore, running more than 8% copper, goes direct to the smelter, while the poorer ore is concentrated from four or five tons into one ton, and this is done cheaply, as it is a perfect milling ore. Last year the cost was about 95c. per ton, and the smelting a little more than $6 per ton. As far as the development work goes this is one of the richest copper districts in America. Although not an old district, it is many times larger than the Butte district of Montana, which today is producing 28,000,000 lb. of copper monthly. Last year's run produced in the neighborhood of 3,000,000 lb. 99% pure copper. This was done without any railroad being built to the smelting works. With the completion of the railroad from Walcott to the smelting works, and with additional steam power, the output could be increased tenfold—so say the promoters of the enterprise. The company for the past 15 months has paid dividends at the rate of 6% on the issued capital of $6,000,000. When the smelter is running with its increased capacity, the quarterly dividend should be at the rate of 12% per annum, and eventually, on completion of the improvements to be carried out with the new capital raised in Europe, the property, when running at full capacity, ought to pay 20 or 25% without any trouble whatever. As to the financial position, there were no loans from bankers, and, according to the audit made recently, it was shown that if all the company's moneys were received from the sale of copper, etc., there would be no liabilities whatever. The ore was not too heavy in sulphides; but it carried sulphur sufficient to be useful in the converters, and also a little iron which was good for fluxing purposes. All the ore in the district carried from $2 to $12 in gold, and from 1 to 3 oz. silver per ton. The president said they were induced to go into the copper industry in America by what has been done in the case of other companies; and in this connection he would read a few interesting figures as to what happened to those who had invested in copper in earlier days: £200 invested in Calumet & Pittsburgh in 1903 is now worth £10,000; £200 invested in Calumet & Arizona in 1902 is now worth £20,000; £200 invested in Greene Consolidated in 1901 is now worth £17,400; £200 invested in United Verde in 1897 is now worth £60,000; £200 invested in Wolverine in 1893 is now worth £10,000; £200 invested in Boston & Montana in 1896 is now worth £3,782.

As a fair comment on these enthusiastic statements, it might be asked what would the 400,000 shares of Penn-Wyoming Copper Co., now being placed in Europe, be worth if the 1,200,000 shares already held in America were transferred to the London market.

According to the *Financial News*, the Fresno Copper Co. was registered in Edinburgh in 1902, with a capital of £400,000, of which, at the present time, 399,774 shares are issued and fully paid. The company was promoted by the vendors (the California Copper Syndicate, Ltd.), and the property, which is situated in Fresno county, California, was reported on by Messrs. Herbert Lang, W. J. Stoneham and H. V. Wheeler. It consists of some 2,500 acres of copper ground and a gold-quartz mine (acquired later). The consideration for the various properties acquired was £300,000, in fully paid shares. All the associations and connections of the company belong to Glasgow, and a quotation was obtained on the Stock Exchange of that city, and at the beginning of the present year there was a fairly firm market in the shares at par; but shortly after the turn of the year the price began to ease off, and it was rumored that the property was not up to the estimates which had been formed of it. At the beginning of last week the shares were quoted about 13s. to 13s. 6d. Some little time ago, in order to allay the anxiety of shareholders, it was determined to send out an independent expert, and Mr. Frederick Siebert was selected. Mr. Siebert's report condemns the property entirely. There was a scene of great excitement on 'change when the news became known, and heavy offerings of shares resulted in a sharp slump to 4s. 6d. It is feared that many small investors have been badly hit.

Mr. Percy F. Martin, who has been touring in Mexico on behalf of a London journal, is of opinion that the equipment of the Esperanza mine is as complete and thorough as could exist. Everything is of the very best possible quality, and yet not a penny is expended extravagantly. He says the fine mill, consisting of 120 stamps and 15 Huntington mills, the cyanide plant, the electric installation, and the whole of the buildings have been paid for. There are no other heavy expenses, other than those attendant upon the conduct and maintenance of the mine, in contemplation or necessary. The mine is regarded by its local management as a clean asset as it stands today, worth, from a most conservative point of view, $4\frac{3}{4}$ times the amount of the subscribed capital, and probably a good deal more.

The Deep Leads water question has reached a most interesting stage. The problem of draining the river bed is now practically solved. It is reported that at Loddon Deep Leads they are the masters of the water. At Victorian Deep Leads hard by, the water will soon be under command. The stupendous nature of the task may be judged from the fact that at Loddon Deep Leads the pumping has been at the rate of 9,000,000 gal. per day, and at Victorian Deep Leads 6,000,000 gal. per day. Mr. C. Algernon Moreing, who has recently returned from a tour of inspection to the mines with which his firm is associated, states his confidence that as regards the gold contents of the wash, the geologists who have reported upon it have not been deceived. He reminded his hearers at a public meeting last week that the water once got out, the mine is dry and the water does not come in again.

A useful contribution to the eternal Chinese labor question is to be found in the proceedings at the last half-yearly meeting of the British North Borneo Co. The chairman, Sir Charles J. Jessel, told the shareholders that an interesting event occurred some two or three months ago, namely, the landing of 200 Chinese at Kudat. One of the things they most required at Borneo is population; and the population that is most readily at hand to inhabit and cultivate that country is the Chinese, and they had already, probably, about 15,000 Chinese in the country. They would like very much to have another 15,000 or even 30,000.

BUTTE, July 28.

Since shipping nearly all of its ore to the Washoe concentrator and smelter at Anaconda, the Red Metal Co. has been saving $2 per ton on its output. The company figures on an average daily output of 1,500 tons for the next 12 months, which would give a total saving for the year of more than $1,000,000. The old smelter of the Red Metal Co., which was acquired by the purchase of all the United Copper interests in Butte, is being rapidly dismantled. The

Red Metal Co. found the United Copper mines badly run down and poorly timbered, but they are being placed in first-class condition, and a higher grade of ore is being mined, though the tonnage has been temporarily reduced to about 1,300 tons per day. The company recently opened two new orebodies, one on the 1,200-ft. level of the Tramway mine, which is being worked through the West Colusa mine of the Boston & Montana Co., and the other on the 1,100-ft. level of the Minnie Healey. The extent of the latter is not yet known, as it was cut while a small drift was being driven. The vein is nearly 30 ft. wide, and about eight feet of it is rich, assays averaging 7% copper. As the ore deposits in the Minnie Healey have been pockety in the past, the company officials have not said much about the find, but development is proceeding to determine its extent. There is a belief among the company's engineers that the new orebody will be found to be a portion of the Leonard vein of the Boston & Montana Co. which pinched out near the eastern end of the Leonard claim, it being the opinion that the vein faulted at that point, and was thrown downward into the ground embraced within the Minnie Healey. Should this theory prove correct the new find would probably develop into one of the most important ever made in the Butte district, as the Leonard vein has been one of the richest and largest. The Tramway vein, however, has been opened for several hundred feet in length. The vein is eight feet wide and the ore high grade. The Red Metal Co. has also opened a new level in the Rarus at a depth of 1,500 ft., where mining is being done on what has been known as vein No. 16, which for years has been worked in the Mountain View by the Boston & Montana Co. The showing at this point is better than at any other place in the Rarus mine. The Red Metal is also opening the Berkeley mine through the old shaft on that property, and a portion of the Snohomish mine is being worked through it. Sinking is going on in both the Rarus and Corra mines, and the 1,600-ft. level in the latter is being opened, and 300 tons of ore are hoisted daily.——The Parrot Co. is mining for the Red Metal Co. on the Nipper vein at the 1,000-ft. level of the Parrot mine, and hoisting 50 tons of ore per day that runs 8% copper, while driving and raising on the vein, and in a week will hoist about 100 tons per day. The Parrot is also developing its own property on the 1,800-ft. level, where the ore is better than that mined on the level above, but not high grade, though there is a gradual improvement with depth. The company is hoisting about 400 tons per day of 3% ore.

The main shaft of the Mountain View mine, of the Boston & Montana Co., is still shut down and undergoing repairs, but hoisting to a limited extent is done through the air shaft. All the other mines of the Boston & Montana Co. are yielding the usual quantity of ore, about 3,500 tons per day, which is shipped to the company's smelter at Great Falls, together with about 200 tons of Red Metal ore.——The Anaconda Copper Co. has completed the three-compartment shaft of the Anaconda mine between the 2,200 and 2,400-ft. levels, and the company is now mining on the lowest level, which is also the lowest opening in the Butte district. The ore at that point is rich, a large portion of the vein assaying 8 to 12% copper, though the vein itself is not so wide as it is on the 2,200-ft. level.

The North Butte Mining Co. is mining on the 1,700-ft. level of the Jessie, which has developed into the best level in the mine. The ore-shoot is longer than on the 1,600 level, is richer and as wide. Very little second-class ore is being mined, the general average of the ore shipped being 7%. The company is now hoisting 1,000 tons per day, and the amount cannot be increased until a number of chutes are built. The North Butte Co. will soon begin driving a cross-cut north into the Berlin claim.

There is no prospect of an early resumption of operations by the Raven Mining Co. The Anaconda Co., which owns the Buffalo shaft through which the Raven Co. worked the Snoozer claim, has offered to hoist all ore that the Raven Co. can mine from the Snoozer, provided the mining is not done on the vein to the apex of which the Butte & Boston Co., an Amalgamated concern, lays claim. This precludes the Raven Co. from mining in the Snoozer because it is without funds to open the other vein in that ground. Owing to the fact that there is such a great distance between levels in the Snoozer—400 ft.—there is much doubt as to the location of the apex of the vein on which the Raven Co. has been mining, many mining men familiar with the ground believing that the vein apexes in the Snoozer ground. It has been urged on Eastern stockholders that they raise the necessary money to open the Raven mine and also sink the old shaft on the Snoozer discovery vein to determine the apex question. The fact, however, that the Red Metal Co. owns one-seventh interest in the Snoozer, and has therefore the power to stop operations at any time is not encouraging to the stockholders to put up money for development. The Raven is developed to a depth of 700 ft., has a hoisting plant of its own, belongs to the Raven company, has a lot of payable silver ore in sight, and has disclosed the apex of a copper vein in the lower workings. The Butte officials of the Raven Co. have made a proposition to stockholders in the East that they raise the money necessary to carry on further development, but no favorable consideration has yet been given the suggestion.

At a depth of 200 ft. the Butte Hill Copper Co. has run a cross-cut north to the vein, which reached a distance of 110 ft. the past week and 80 ft. of it is in a vein, and the last assays taken show 15 oz. silver and half of one per cent copper per ton. The company has the vein of the North Star mine, which was formerly worked by Marcus Daly and yielded a great deal of silver. It is the vein that runs through the Colleen Bawn of the Butte & Bacorn Co., lying a short distance east of the Jessie S., the claim on which the Butte Hill Co. is working. The Butte & Bacorn Co. is developing the same vein, but will do no cross-cutting until a depth of 500 ft. is reached.

C. J. Adimi, for years foreman of the Gagnon mine at Butte, has become general manager of the gold properties of the Cable Consolidated Co., which has just started its own hoisting machinery and is increasing its output. The company has also begun exploration of its 400 acres of placer ground, and will bore 400 or 500 holes to bedrock to determine the value of the ground as a dredging proposition. Results so far are reported satisfactory.

The Pittsburgh & Montana Co., since it has abandoned its experimental smelter and is shipping ore to the Washoe smelter, is making a profit on its operations. There is a general denial on both sides of the story that Butte Coalition is negotiating for the purchase of the Pittsburgh & Montana property.——The Red Metal Co. has secured a transfer from United Copper interests of the Homestake mine, an outstanding interest in the Belmont, three-fourths of the Nora, and one-fourth each in the Canyon and Colleen Bawn claims, lying southeast of the city.

The Butte Copper Co., which is cross-cutting north from the Trifle shaft, at a depth of 300 ft., to get the north Anselmo vein, an extension of the Gagnon and Original vein, is putting up new surface machinery, including boilers, an air compressor, pumps and head-frame. As soon as it is up the company will sink the shaft several hundred feet deeper while mining the Anselmo vein.

PRESCOTT, July 28.

The building and successful operation of the 800-ton custom smelter by the Arizona Smelting Co. at Humboldt in Yavapai county, has given the mining industry in north-central Arizona new life, which in some sections would be called a boom. The company is receiving all the ore it can handle at present, and the management is considering plans for doubling the capacity of the plant.——Lawler & Wells have sold their copper property, on Copper creek, to a company which has 25 men on development work. This property contains one of the biggest low-grade copper deposits in Arizona. There is abundance of water power near by to drive all the necessary machinery of the mine and reduction works.——A. J. Pickerell has sold his Mineral Hill group of copper mines on the Bill Williams Fork to Chicago men. The new owners are now making preparations to erect a smelter of 200 tons daily capacity. A great amount of development work has been done on this property. Distance from railroad has heretofore kept it from the list of producers. The Arizona & California railroad is now building in this vicinity and will materially aid development of the district.

Fennell & Davis are unwatering the Last Chance mine near Prescott and will cross-cut to the vein from three levels in the 500-ft. shaft.——The Triangle Mines Co. has reached a depth of 350 ft. in the shaft on its property in Chaparral district, near the McCabe mine. The sulphide ore is rich in gold and the vein averages from three to five feet in width.

There has never been a time in the history of this part of Arizona when there was so much activity in the mining business as now. More miners are at work here today than ever before. Every district in the county is active, and money is seeking legitimate investment in the mining business. The big low-grade deposits of gold and copper are now, for the first time, receiving the attention they deserve. Lack of transportation facilities has, in some cases, been the great drawback to many properties but this will soon be remedied by railroads being built. Another serious obstacle was the lack of water for milling purposes. This, too, seems to have been overcome by unusual rains, supposed to be due to the filling of the Salton sink in California by the water of the Colorado river. The excessive heat in the Salton basin country results in great evaporation. Southwest winds carry this moisture over the higher altitudes of Arizona and Nevada where it is precipitated by the cooler atmosphere. Some have said off-hand that the filling of the Salton sink can have no possible effect on the climate of Arizona. The United States Government has kept a record of precipitation at Whipple Barracks, near Prescott, since the post was established in the '60s, and the annual rainfall has averaged between six and eight inches. Last year the rainfall reached 40 in. and this year it promises to be even greater than this. Water is abundant everywhere. A country cannot be called arid that has such a large precipitation. If the Salton sea is not causing this great rainfall in this part of Arizona, I would like to ask some of the eminent weather observers what has caused it? Anyhow, the railroads are being built, the water is here in abundance, and the big low-grade deposits of gold and copper ore are being investigated by individuals and corporations seeking large, safe investments.

CALUMET, Aug. 1.

An abstract from the annual report of the Calumet & Hecla Mining Co. for the fiscal year ending April 30 is given herewith:

ASSETS.

	1906.	1905.	1904.
Cash at mine	$ 120,257	$ 133,047	$ 116,917
Cash at New York	15,000	15,000	15,000
Cash at Boston	*7,817,994	†6,496,133	‡5,939,001
Development & equipment fund	1,827,544	.....	.....
Insurance fund	990,858	927,034	757,691
Bills receivable	1,140,122	590,213	451,521
Employees aid fund	4,906	10,991	6,208
Total	$11,916,681	$8,172,418	$7,286,338

LIABILITIES.

Drafts in transit	$ 38,481	$111,668	$ 67,682
Bills payable	370,381	313,560	305,617
Mill machinery	878,000	603,000	330,000
Total	$1,286,862	$1,028,228	$703,299
Balance	$10,629,819	$7,144,189	$6,583,039

*Including copper at 18c. per lb. and mineral at 7c. per pound.
†Including copper at 15c. per lb. and mineral at 6c. per pound.
‡Including exchange loans receivable, copper at 13c. per lb. and mineral at 5c. per pound.

President Agassiz says: During the past year we produced mineral equal to 43,652 tons of refined copper, as against 43,090 tons last year. Our product of refined copper was 50,526 tons; for the previous year our product of refined copper was 42,822 tons. The price of copper has varied from 15½ to 19c. per lb. It is now about 18¾ cents.

There have been paid during the past year two dividends of $15 each and two of $10.

Since last May we have remodeled six of the Hecla mill stamps so that we now have 23 modern stamps in commission. We have already started remodeling the remaining five old heads to treat amygdaloid rock and hope to have them in commission by May 1, 1907. They will have a capacity of 3,000 tons daily.

The Calumet mill, as remodeled, has run most satisfactorily during the past year. The value of copper saved each year by the new system of stamping and washing has thus far practically equalled the cost of reconstruction of the mill. A great part of the mill-trestle connecting the bins with the railroad has been filled in. This work will be continued whenever practicable. The warehouse at the lake has been moved to a new location on the extension of the coal-docks.

We have continued our experiments upon the tailing from our mill and hope soon to make plans for the erection of a mill intended to save a good part of the fine copper we are now losing.

The addition to the electric power-house at Torch lake has been completed. Two of the large hoisting engines built for mining the Osceola lode have been erected there, so that we now have in our power-house a capacity of 9,000 h.p.; the building is large enough to allow the erection there of the third Osceola hoisting engine when needed, adding about 30% to our available horsepower.

At the Lake Linden smelting works we have remodeled the laboratory to meet the growing demands of the smelter and mills. It will be necessary during the coming summer to rebuild our cupola furnace, remodel five of the remaining furnaces and build a new mineral house at a total cost of about $105,000.

At the Buffalo smelting works, we have rebuilt one of our furnaces and installed two waste-heat boilers. The whole of our plant is now run by electric motors, power being supplied by means of the generator in the central boiler-plant at our electrolytic works.

The stockholders of this company passed a vote at the last annual meeting authorizing the directors to avail themselves of a law recently passed by the Michigan Legislature, permitting mining companies, if authorized by a vote of their directors, to subscribe for, purchase and be interested in the stock of any other company formed for mining, smelting or manufacturing wholly or at any place other than in the State of Michigan. This statute provides a simple and effective method for the rapid development of the mineral lands of the upper peninsula of Michigan; lands, many of which have remained undeveloped for want of capital from the earliest date of copper mining in the State. Under this vote, and in accordance with the statute, we have organized, under the laws of Michigan, the Manitou Mining Co., of which we own nine-tenths of the stock. The territory controlled by this company amounts to 38,693.55 acres. The Frontenac Copper Co. has also been organized, under the laws of Michigan, to hold the mineral and other lands we purchased from the Central Mining Co., the Manice lands and other tracts in Kekeenaw county. The territory owned by the Frontenac Copper Co. covers 22,268.50 acres; we hold the whole stock of this company. We are exploring, with diamond-drills, a part of the lands of the Frontenac and Manitou companies to fix the position of the various copper-bearing lodes which cross them. On the Delaware property (now Manitou) we are drifting from the bottom of a shaft 100 ft. deep on the Montreal amygdaloid; the showing of copper in this vein is fair. We have located thus far the Calumet conglomerate, the Osceola amygdaloid and the Kearsarge conglomerate on this property. We have continued active exploration of the Superior mine, of which we hold the option on 51% of the stock until August 31, 1906. We have secured an extension of this option until December 31, 1906, and hope by that time to have sufficient information as to its probable value to come to a decision regarding it. We have spent thus far $42,000 in exploring that property. The Superior has 400 acres. For $25,000 we have secured an option on the Nonesuch mine in Ontonagon county, which expires in June, 1907. The payment was based upon preliminary tests of milling the rock from the copper-bearing belt of that name. The Nonesuch has 640 acres. We have obtained an option on a majority of the shares of the Gratiot Mining Co., organized under the laws of Maine. The mine is on the extension of the Kearsarge lode, north of the Mohawk; it has a probable length on the line of the Kearsarge lode of 5,960 ft. to a depth on the slope of 2,540 ft. The Gratiot has 600 acres. We have taken an option on the land of the New Jersey Mining Co., which runs for two years, and contains 720 acres on the mineral belt and 1,540 acres south of Lac La Belle. We have taken options on other parcels of land containing approximately 2,000 acres on the mineral belt, which are more or less surrounded by the present holdings of the Manitou and Frontenac companies. We have also taken options on 51% of the stock of the Caldwell Copper Co. and of the La Salle Copper Co.,

both having two years to run. The Caldwell Copper Co. controls 520 acres and the La Salle Copper Co. 840 acres next to the property of the Tecumseh Mining Co. We have paid for the lands of the Frontenac Copper Co. and the Manitou Mining Co. $704,964; for exploration on the Superior, $42,000; for an option on the New Jersey, $10,000; and for an option on the Nonesuch, $25,000. Should we exercise our options for the purchase of the New Jersey, Nonesuch; and the control of the Superior, Caldwell, La Salle, Gratiot and other options, there remains to be paid $1,555,000.

The purchase of some of these properties has given us a large supply of timber, and we hope in time to find producing mines which may materially add to the output of the Calumet & Hecla proper. For these purchases and their development the directors have laid aside, as a development fund, the sum of $2,000,000, which has been increased by $750,000 since April 30, 1906.

It will be seen by this report and the statement of assets and liabilities that during the past year we have spent large sums for the purchase of new properties and planned for the expenditure of important sums to develop them. Large outlays will also be made during the coming year at the smelting works and shops, in equipping the Hecla & Torch Lake Railroad and in broadening its gauge, in remodeling a part of the Hecla mill, in duplicating our water supply from the Lake Superior station, in erecting a foundry, completing the electric power plant and distributing electric power. All this is needed to carry on the mine with economy while working on its present scale.

CRIPPLE CREEK, July 30.

The original plan of driving a deep drainage adit to unwater the district has been practically abandoned, and a scheme is now on foot for a new drainage tunnel, known as the intermediate tunnel, which will not be so deep by about 350 ft., will cost less, and be completed more quickly than the original. It is estimated that the new adit will only take 18 to 20 months as against three years, and cost about $200,000 less than the deeper 'tunnel' first proposed. This scheme is finding more favor with the mining companies. It is proposed to use the water from the adit for power purposes.

Grant & Co., operating on the Pike's Peak of the Stratton Estate, on Bull hill, made a shipment of sacked ore to the Eagle sampler on the 24th inst. This ore was obtained from the 300-ft. level where a rich narrow streak is being mined. Assays as high as 15 oz. per ton have been obtained from this sacked ore.——The second consignment this month of about 200 tons of low-grade ore from the Ramona lease of Hembie & Co. is being hauled to the Ironclad cyanide mill. The ore averages about $8 per ton and is mined at a depth of 200 ft. A similar shipment is also being made to the Ironclad mill from the War Eagles on Bull hill by Hervey & Darnell, lessees.

The three samplers of the district, the Eagle, Taylor & Brunton and the Cripple Creek Sampling & Ore Co., have raised the rates for sampling ore, which they buy, from 60c. per ton to $1 per ton. Ore which is only sampled in transit will still be charged for at the old rate of 60c. The reason for this raise is said by the samplers to be their inability to make enough profit under the old rates.——The extensive alterations to the old Telluride mill, at Colorado City, are nearing completion and it will soon be in condition to handle the output of the Golden Cycle mine on Bull hill and also a portion of the Findley ore. The mill will have a capacity of about 300 tons per day and is expected to be running by October 1.

Becker & Travell, operating a lease on the northern part of the Granite property on Battle mountain, have sunk the Cody shaft to a depth of 125 ft. At the bottom of the shaft is a strong vein which is supposed to be a continuation of the Independence vein, which, on the Portland Co.'s ground, is known as the West Bobtail.——An average of three cars of ore per day is being shipped by the Isabella mine on the north slope of Bull hill. The ore is being mined by the company and about thirty sets of lessees.——The Ætna Development Co., leasing the Index mine on Gold hill, started work today. Two drills will be put to work, one on the cross-cut which was previously being driven at a depth of 465 ft., known as the third level, and the other on ore at the bottom of the 700-ft. level. Sub-lessees Swanson and Martinson, operating on the 700-ft. level of this mine, shipped a car of ore last week which ran $42 per ton.

The American Eagles mine, one of the largest properties of the Stratton Estate, situated on Bull hill, is closed down. It has been under lease for the last 18 months to Cox & Durbin and associates, who have been paying to the trustees of Stratton Estate 25% flat royalty on all ores shipped. J. H. S. Cox has applied to have this royalty reduced, as he claims that the royalty is too high when the cost of running the large top plant of machinery is taken into consideration.

SALT LAKE, July 28.

The sensation of the week in Utah mining circles has been developments in the coal land cases. As yet, no criminal action has been started, but the Government is plaintiff in four civil actions filed in the Federal court in this city. The defendants are the Utah Fuel Co. and the Pleasant Valley Coal Co., both of which are charged with fraud, deception and conspiracy, in obtaining possession of between 20,000 and 30,000 acres of coal land. There are two actions against each of the defendants, under distinct classifications. One class deals exclusively with lands that have been acquired from the State of Utah through its land board, while the other has reference to lands that have been acquired direct from the Government under the coal-land laws of 1873. It is charged, with regard to the last named law, that individuals in the employ of the company filed on quarter-sections of land, which they deeded to either of the defendants for a consideration, contrary to the purposes of said law. The suits were filed in the name of William H. Moody, Attorney-General of the United States. The land in question is in Carbon county. The Government seeks to have title to these lands vacated and proposes to sue for the value of the coal extracted therefrom. A number of prominent citizens of the State are involved, and it is not improbable that criminal actions will follow, although officials of the Government are concealing this part of the program. Among those accused of being active in the alleged conspiracy are William F. Colton, president and treasurer of the Pleasant Valley Coal Co., Robert Forrester, geologist, of the Utah Fuel and Pleasant Valley Coal companies, H. G. Williams, manager of the first-named company, William H. Bird (deceased), attorney for both companies, Royal C. Peabody, of Boston, an official of the Pleasant Valley Coal Co., Charles M. Owen, a civil engineer, and others. The members of a former State land board, of which ex-Governor Heber M. Wells was president and Byron Groo secretary, were severely criticised for gross negligence. Special agents of the Government have been working on the cases for more than a year, and it is said other actions are likely to follow.

In Bingham district the Utah Copper Co. will begin stripping overburden with steam-shovel within a few days. All of the equipment for the Utah Apex aerial tramway has arrived at Bingham and work on the terminals will begin next week. Construction of the new compressor building will also be started. The tramway will be 2,500 ft. long.——The new compressor plant at the New England Gold & Copper Co.'s mine, at Bingham, is in service.——At the Montezuma mine, at Bingham, a 12-in. vein of high-grade lead ore has been encountered in a drift south from the shaft on the 200 level; there is ore in the north drift and another fissure has been found in a cross-cut west from the shaft. Shipments will be made soon.

At Alta an important strike has been made in a cross-cut west from the adit level of the Columbus Consolidated mine, where a contact-vein has been encountered showing shipping ore, which assays 30 to 40% lead, 40 oz. silver and 3% copper. The find is 1,500 ft. from the developed portion of the mine. The vein has been followed for 30 ft. and shows a width of seven feet.

W. A. Clark, president of the San Pedro, Los Angeles & Salt Lake Railroad, states that he has given orders for the survey of a line of railroad into the Deep Creek mining district. Salt Lake business men are seeking a more direct

route to Ely, Nevada, and one that will tap the Deep Creek camps as well.

Ore shipments from the Tintic district last week aggregated 147 carloads, the contributing mines and amounts being: Ajax, 2; Carisa, 6; Centennial-Eureka, 42; Beck Tunnel, 7; Black Jack, 8; Bullion-Beck, 6; Dragon Iron, 9; Eureka Hill, 3; Eagle & Blue Bell, 3; Gemini, 3; Grand Central, 6; Godiva (concentrate), 2; Mammoth, 21; May Day, 3; Ridge & Valley, 2; Scranton, 4; Swansea, 3; So. Swansea, 1; Uncle Sam, 2; Uncle Sam (concentrate), 2; Victoria, 6; Yankee, 4.——A new wage schedule goes into effect in the Tintic district August 1. Single-hand men are to get $3 per day, machine helpers $3, and muckers, $2.50.

JOHANNESBURG, July 2.

The reduction of the cost of living on the Rand was one of the results expected after the war. The failure to cheapen the living expenses and to lessen the cost of production is very apparent. After four years of British control, the Transvaal is no better off, in regard to costs, than under the Kruger regime. Today the married artisan finds it impossible to keep himself and family on less than £26 per month. A recent conference was held to consider tariffs, etc. The other colonies of South Africa have benefited at the expense of the Transvaal. More burdens are imposed on this colony, and as the tax falls on foodstuffs, the very poor will be the chief sufferers. Already the cost of much mining material and of foodstuffs has risen. The fact of the matter is that mining is almost the only taxable industry in South Africa. It is felt here that the De Beers Diamond Co., at Kimberley, has not borne its fair burden of taxation, and that the Rand is to be bled still more, in order that Kimberley may escape. Critics should remember the enormous burden in taxation that the Rand has to bear, when they find fault with the high mining costs prevailing here. There are few industries in the world that are taxed as heavily as the mines of the Rand. Not only is there the direct tax of 10% on profit, but there is the indirect taxation which amounts to much more. Take the railroads, for instance, which are owned by the Government and are run for revenue. The rates prevailing are exorbitant. A ton of coal at the Middleburg mines is sold for 6s. per ton. The railroad charges 10s. per ton to deliver this coal to a mine on the west Rand. It costs no more to send a ship-load of timber from San Francisco to New York, load it onto a steamer and send it all the way to Durban, than it costs to unload the same timber and send it to Johannesburg. With such conditions, how is it possible to show low working costs on a mine?

The behavior of the coolies over the much talked of poster has been a surprise to everyone. The best informed people thought that at least 1,000 Chinamen would take advantage of the offer of the Liberal party and go back to China. Up to date, 12 men out of 50,000 have asked to go back! What a vindication for the people of the Rand, after the campaign of lies and calumnies of the Liberal party! It is now feared that the Liberal party, out of a feeling of sheer pique, will frame another poster and almost force the coolies to go home. It has now been proved beyond the shadow of a doubt that the coolies are quite contended with the Rand, and do not want to go home. They have never been in better circumstances in their lives.

There has been much comment on the high death-rate from accidents prevailing on the mines of the Rand. It is the highest in the world, and has been going steadily up. At the present it is about 6.69 per 1,000 per annum. The death-rate of the white employees is about 4.4 per 1,000 per annum. Compared with 1.5, the rate prevailing in the mines of Great Britain, these figures are appalling.

The main reason for the high death-rate on the Rand is the class of labor we have to deal with. When a mine is worked by raw Chinese or Kaffirs, who have no mining sense, it is almost impossible to prevent accidents. They have a way of getting into dangerous places, and doing what they should not do. Sometimes the action of one coolie or Kaffir endangers the lives of many men, as in a blasting accident. Fall of rock and blasting accidents cause the greatest number of deaths on the mines. Raw coolies and Kaffirs have a way of treating dynamite and detonators with scant respect, until one or two of them are blown up. On one mine quite a novel method was recently adopted, to impress a new batch of Chinese with the dangers of explosives. All the coolies who had been maimed by mine explosions were paraded before the newcomers. At the same time one or two interpreters walked among the new coolies with a few detonators, fuse and dynamite, and warned them of the danger of fooling with these instruments of the evil one. So far none of these coolies have been injured by explosives.

TORONTO, July 27.

The increased importance of the Canadian mining industry is shown by the reports of the foreign trade of the Dominion for the fiscal year ending June 30, a summary of which has just been published. Exports of products of the mines show a total value of $35,469,631, as against $31,932,329 for the previous year.

A branch mining record office has been opened at Cobalt in response to the appeals of the miners and prospectors for better facilities for recording claims; T. A. McArthur is in charge. M. B. Baker has been appointed assistant inspector of the division.——An important discovery has been made on the Gillies timber limit, adjoining the Cobalt area on the south, now being prospected for the Provincial Government by a party under the direction of Willet G. Miller, Provincial Geologist. A vein of smaltite, or arsenide of cobalt, has been found six inches in width, at a depth of three or four feet below the surface. The find is regarded as of great value. The vein is to be stripped for examination. The exploration party will be joined by E. T. Corkill, Provincial Inspector of Mines, next week.——Several prominent mining men and financiers have visited Cobalt lately with a view to investment. Among the number are John McKane and John J. Adams, of New York, representing the Schwab interests, H. M. Whitney, of Boston, and William G. Thomas, of Quebec.

At the Nipissing mines, at Cobalt, several new strikes are reported. The outcropping of a rich smaltite vein shows a lump weighing 250 lb. Ledge 26, which at first showed a narrow vein, widened steadily as it was followed downward, and now at 60 ft. discloses a rich vein 7 to 10 in. wide. It is being cut in a northerly direction and the large mass above noted was found near its northern extension. A third vein apparently runs to a point of junction with these two and a shaft is being sunk, from which drifts will be run into all three at about the 80-ft. level. The value of the output of Ledge 26 since it was opened last fall amounts to over $250,000.——A find of pure silver has been made on the Gates property, at Clear lake, at a depth of 45 ft.——Six miners have been arrested for stealing ore from Cobalt mines and disposing of it to jewelers and makers of souvenirs, such as fancy pins, etc. The thefts had been suspected for some time and the Mine Owners' Association employed private detectives, who discovered that ore to the value of thousands of dollars had been stolen and disposed of at Toronto.

Numbers of prospectors continue to leave the Cobalt area for the Lake Opastica gold region. Little further information is obtainable as to the actual value of the finds in that quarter. While there is no doubt that gold exists there in appreciable quantities, its occurrence over any considerable area in a commercially valuable form is regarded as an open question. Thomas W. Gibson, Deputy Minister of Mines for Ontario, states that as scarcely any development work has been done, any estimate of the value of the new field is premature. He is of the opinion, however, that for the most part the mineral deposits are of low-grade ore.

The iron mines at Ironsides, near Hull, Quebec, which have not been worked for 25 years, are being subjected to tests with diamond-drills, borings being made to a depth of 400 ft. to ascertain their possibilities. American capitalists are interesting themselves in the result, with a view to establishing electric smelters should a supply of the raw material from this source be available.——A find of radio-active mineral is reported near Murray bay, Quebec Province. Samples have been sent to Paris by A. J. Lippens and H. M. Lippens, members of a mining syndicate who made the discovery. A. Fieux, a French mining expert who has been experimenting with it, asserts that it exists in paying quantities.

Thomas G. Blackstock died in Toronto on July 24 from

bright's disease, aged 54 years. He was prominent in legal and financial circles and, in connection with his late father-in-law George Gooderham, he was largely interested in the War Eagle and Centre Star gold mines at Rossland, B. C., and in the St. Eugene mine. He had been in ill health for several years. A widow and seven children survive him. ——G. A. Guess, graduate of the Queen's School of Mining, Kingston, Ont., has been appointed superintendent of the reduction department for the Greene Consolidated Copper Co. at Cananea, Mex.——F. J. Lee, of Helena, Mont., who has just returned from a visit to the Yukon district, expresses the opinion that Hatfield, the rain maker, has not been fairly treated in being refused the sum agreed upon in case of an increase in the water supply. He states that on Dominion creek, with a watershed of 45 miles square, the increase in the rainfall has been fully 500%, every one having water enough, whereas last season work had to be suspended on account of drought. Mr. Lee states that the difficulty as regards water is owing to the mistake of the miners in sluicing from inadequate watersheds, the supply from which would be insufficient even in unusually wet seasons.

DENVER, July 29.

Following one of its most disastrous winters, the San Juan country is now enjoying a high degree of prosperity. New enterprises, requiring large outlays of money, are assured, the money having been secured before the debris of the storms was cleared away. Lake, Clear Creek, Gilpin, Summit and all the prominent older mining counties are daily adding to their productive areas, opening up new bodies of ore in old mines and finding pay-shoots in heretofore undeveloped ground, forcing the conclusion that the best opportunities are still in the old mining districts, especially in properties that have produced in the past, but from one cause or another have been idle for a time. Capital from outside the State is largely interested in these developments. If any one part of Colorado is suffering for lack of capital, at least one of the reasons is disregard, in the past, of the rights and interests of the investor. It is no excuse to say that other sections are reaping a harvest from similar dishonest methods. The apparent prosperity is temporary and the day of reckoning inevitable; each district must pay the price of a bad reputation.

For more than 25 years the gulches of the Mosquito range have been prospected for the extension of the Leadville gold belt. W. P. Dewey and associates, owning ground in Big English gulch, have been prospecting about seven miles north of the Ibex mine. The Dewey property was taken over by the Bug Gold Mining Co. and a lease of part of the ground made to James Robinson, who is operating under the name of the J. B. Robinson Leasing & Mining Co. The country is traversed by a large porphyry dike. Robinson drove an adit in the dike about 100 ft. and has encountered a body of ore, which gives promise of great extent. The ore is a sulphide carrying 3 to 6% copper and as high as 5 oz. gold and 20 oz. silver per ton. The shoot is said to be of the Leadville blanket type and there is some local excitement over the discovery.

Prospecting by diamond-drill through the Yak adit, by drilling the ground at intervals of 100 ft. over an extent of 1,500 ft., is believed to have demonstrated the existence of ore nearly 100 ft. thick lying in a lower contact. The company has not given out any information concerning the result of its exploration, but it is generally believed that the ore was found in a contact plane lying 300 to 500 ft. below the floor of the Yak adit and on the trend of the Silver Cord ore-shoot. The Silver Cord winze will be continued 300 ft. to the new find, giving it a total depth of 600 feet.

The Japan-Flora group of mines, in San Miguel county, which has been under working option for several years past to A. G. Brownlee and associates, has been transferred to the Japan-Flora Mines Co. The company is composed of Philadelphia capitalists with Col. Brownlee, of Denver, who is the general manager. The property consists of the original Japan-Flora group, the Ajax group and the Valley View group. For a number of years the course of the Smuggler-Union vein southeast was in doubt. I believe it was the late Arthur Collins, manager of the Smuggler-Union, who identified the Ajax vein as the continuation of the Smuggler-Union. The Japan-Flora Mines Co. is credited with having spent about $250,000 in development work under its option, uncovering large bodies of milling ore. The company is now planning the erection of suitable reduction works.

The activity in San Juan county is spreading. Poughkeepsie gulch, long neglected, because of its extremely difficult conditions, brings forth the most sensational gold strike of the season. A large vein of quartz carrying a high-grade gold vein, about one foot wide, has been found by J. W. McDonald near the old Letcher property. Four samples of the streak assayed, respectively, 4 oz., 15 oz., 32 oz. and 155 oz. gold per ton.——Red Mountain, in Ouray and San Juan counties, is an active camp. Under the persistent drainage scheme planned by George Crawford, large bodies of ore have been made available for extraction and plans are being arranged to re-open such old-time producers as the Yankee Girl and Guston mines.——A strike of high-grade silver ore in the Big Bend group of mines, on Saxon mountain, in Clear Creek county, is causing local excitement. The ore is described as a carbonate carrying 1,000 to over 20,000 oz. silver per ton in a streak eight inches thick, containing native silver and silver glance. The find was made in a new location, in one of the oldest mining districts in the State.——Cincinnati and Denver parties, incorporated under the name of the International Mining, Milling & Smelting Co., have closed a deal for property on Columbia and Democrat mountains in Clear Creek county, including the Claypool tunnel, an adit 1,150 feet long.

BISBEE, July 30.

The Holbrook shaft of the Copper Queen Consolidated Mining Co., which had been settling for some time past, finally caved on Monday last. The shaft has been filled with waste from the 100-ft. level to the surface, to prevent more damage. As soon as the ground ceases settling, the work of repairing the shaft will be commenced. At the Copper Queen, the mains are being laid to distribute compressed air to the different shafts for operation of the air-hammer drills, a large number of which have been purchased. They will be used in the hard stopes. At the Copper Queen smelter, furnace No. 9 has been finished, and will soon be blown in. The scaffolding for the new smoke stack is nearing completion. The material for the new reverberatory furnace has arrived, and construction will be commenced at once. At the Calumet & Arizona, things are going along about the same as usual, with no important changes.——At the Shattuck-Arizona the 600, 700 and 800-ft. levels are being developed. On the 600, the drift is in vein-matter and iron ore. On the 700, two high-grade orebodies have been encountered; one is oxide and the other is sulphide. On the 800, the drift is in low-grade sulphide, and two raises are being cut to the 700. In the shaft a new air-line is being installed, as well as a new water-column. On the surface the new steel head-frame is being erected, and orebins and tramway are being rushed to completion, the cables for the tramway having arrived. The new change-house will be occupied on Monday. The railroad company is building a spur for the accommodation of the Shattuck.——At the Denn-Arizona the drift is still in silicious iron ore. It is the intention to connect with Saginaw, and intercept the drill-bore. In the shaft also, iron ore has been encountered, and the management is confident that this is the fore-runner of a large body of copper ore. The stations for the pumps have been completed. The water remains about the same. ——At the Cochise the shaft has been sunk to a depth of 630 ft. and is in decomposed porphyry. The drift on the 315-ft. level has been driven 680 ft. and several small orebodies have been encountered, but it is not expected to reach the main orebody in less than 125 ft. more. The first which will be encountered will probably be the extension of that found by the Copper Queen, on the 1,200-ft. level of the Czar shaft. There have been many improvements made on the surface, the principal one being the installation of a new 150-h.p. boiler. —— At Tombstone additional boilers and engines are ready to begin again unwatering the mines. At present the pumps are lifting 4,000,000 gal. of water per diem which, with the new equipment, will be greatly increased. The Tombstone mines are now shipping 25 cars of ore per week to the smelters at El Paso.

Mining Summary.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—The Mogollon Mountain Coal Co. has been organized at Safford, and plans have been perfected for the location and development of coal lands recently discovered in the Mogollon mountains of New Mexico, about 45 miles from the Arizona line. Twelve directors were elected as follows: George A. Olney, Z. C. Prina, John J. Birdno, Lee N. Stratton, John W. Casteel, Jos. McKinney, Wm. Robertson, Y. Huston, W. B. Funda, Peter Andersen, Thos. Cunningham and Nathaniel Wanslee. Mr. Cunningham was elected superintendent and general manager.——The directors of the Home Copper Co. met this week to hear a verbal report of the superintendent—N. L. Jenkins—concerning development work. Mr. Jenkins stated that the new whim is now in operation and the water has been bailed out of the main shaft, in which sinking will now be continued. This company is in better shape than heretofore, and development work is in progress.——While grading to move the hoist from the wagon-road to the shaft at the Gold Belt Development & Reduction Co.'s property last week, a strike was made 300 ft. from the shaft, where a vein two feet wide was uncovered. It is specked with free gold, and had been covered up by the wash.——N. C. Lewis, of Clifton, is working on the timber construction for the hoist which is nearly ready for use. It is the intention to run by August 1.——A report has just reached here of a cave in the Coronado mine, a property of the Arizona Copper Co., situated two miles above Metcalf, in which three miners—one American and two Mexicans—were entombed. No details have yet been obtained.——Frank McLean, foreman of the West Yankee mine (a Detroit Copper Co. property), has gone to the Pacific coast to spend a month.——Frank D. Rathburn, of the Detroit Copper Co. mine office, has been placed in charge of the development work now being done at the Santa Rosa mine by the Detroit Copper Co.——George H. Booth, mechanical draughtsman for the Detroit Copper Co., has been temporarily transferred to Globe to do some special drawing for Mr. L. D. Ricketts, of the Old Dominion Copper Co. It will take two weeks to complete the work.

Morenci, July 28.

CALIFORNIA.

AMADOR COUNTY.

It is reported at Jackson that W. F. Detert will sink a deep shaft on the property known as the Hoffman field, situated south of the Argonaut and Muldoon mines, near Jackson, to work on an ore-shoot discovered at a depth of 1,200 ft. by means of a level run south 1,900 ft. through the Argonaut property.

BUTTE COUNTY.

The Southern Cross at Enterprise has been closed, owing, it is said, to the financial stringency caused by the burning of San Francisco. Algernon Del Mar is superintendent.

DEL NORTE COUNTY.

(Special Correspondence).—W. H. H. McCutcheon and associates on Myrtle creek are preparing to work their property on a much larger scale, having acquired the Wagner and other water-rights. They are so much encouraged by the showing made in their prospects that they will put on men preparing for the next winter's work.——L. T. Hendricks and Percy Blake left the first of the week with tools and provisions to examine their Preston Peak property, a large silver and gold proposition, and if the value of the ore is sufficient to overcome the expense of mining and transportation, the mine will be equipped.——On August 20 the Elkhorn mining property will be sold to satisfy a judgment rendered July 28. It is reported that if satisfactory arrangements can be made, parties are ready to take the property and resume operations without delay.

Crescent City, July 28.

EL DORADO COUNTY.

(Special Correspondence).—The Havillah mine, at Nashville, after two and one-half years' operation, has been closed down, the management apparently being unable to make the venture profitable. The main shaft was sunk to 1,200 ft., and a drift run south 500 ft., and one north 1,600 ft., into the Montezuma ground adjoining, where a short shoot of ore was encountered. Although the mine was well equipped with hoisting machinery, enough ore could not be broken, or, at least, hoisted, to keep the 20-stamp mill in operation. Prior to this last effort to work the Havillah mine, the property had been idle for many years, although it was one of the earliest quartz mines in California to be worked, and one of the first, if not the first, to have a stamp-mill.

Nashville, July 28.

(Special Correspondence).—At the Fort Jim mine, six miles from Placerville, Philip S. Baker has an adit 600 ft. in the gravel, which he is running through a roller-mill.——White & Richards are prospecting with a Keystone drill, 2½ miles from Newtown.——About five miles above Fairplay, F. M. Phelps is driving to intersect an ancient channel, on which he owns 900 acres. The drills are run by water-power.

Placerville, July 23.

INYO COUNTY.

It is reported that the Ratcliff mine, at Ballarat, in Panamint district, is under option to Salt Lake mining men who propose to re-open it. This property has been idle for several years, having been closed down by creditors under foreclosure of mortgage. The mine is equipped with a 20-stamp mill and a pipe-line conveying water from Stone Corral three miles distant.——According to press reports, terrible heat conditions prevail in the goldfields of Inyo county, and several lives have been lost. Mr. W. H. Adams, a mining engineer, who has just returned to Los Angeles from Panamint, says that eight prospectors were brought in dead from the heat while he was in that region. During his stay at Panamint six bodies were brought there, all victims of sunstroke. The heat, he says, is terrible and unabated day or night. At Ballarat, he relates, the thermometer registered 135 deg. at noon, and at midnight following, had dropped to only 116 deg., which was the average for three days. In the desert section lying south of Redlands, he says, the mercury went up to 160 deg. and could record no higher.

NEVADA COUNTY.

The Delhi Co. has purchased the large Reidler steam pump that was formerly in use at the Allison Ranch mine, below Grass Valley, for use in the Delhi mine, above Columbia Hill.——The grading for the 20-stamp at the Prescott hill shaft of the Sultana group, is completed and the building of concrete foundations is nearly finished. The mortar blocks will be of concrete.

Work on the Pennsylvania and W. Y. O. D. mines at Grass Valley has been temporarily suspended, owing to bad air in the workings.

SAN BERNARDINO COUNTY.

The Arizona-Mexican Mining & Smelting Co. received the past week seven cars of concentrate from the Humboldt Smelter at Needles. The yard is filling rapidly with ore received. The roaster is handling 30 tons of concentrate per day. The first carload of copper ore from the Valley Wells property, recently purchased by the company, is now on the way and teams are hauling more to the railroad. The company expects to start up the lead stack about August 15, The copper stack is being erected as rapidly as possible.

(Special Correspondence).—The Trojan Mining Co., having leased from the Bonanza King Development Co. its mine (the Bonanza King), in Providence mountains, has begun erection of a 10-stamp combination silver mill and expects in the near future to install 10 more stamps. The old workings proved to have a great deal of available ore, as the company that operated the property 20 years ago, and which only discontinued operations when its mill was destroyed by fire, worked little ore that would go less than 40 oz. silver. It is the purpose of the new company to sink below the sixth level, which is at 460 ft. The mill was installed under contract by Elliott & Drescher, of Prescott, Ariz. Power is furnished throughout the mill and pumping stations (except the hoist, which is steam) by distillate engines, of the Western Gas Engine Co. of Los Angeles. The old dumps are estimated to contain 225,000 tons. E. J.

De Lano, former superintendent, having resigned, A. M. Rockwell, late superintendent of the White Gold Mining Co., has assumed charge of the mine and mill, and is at present working 75 men, expecting to increase this force when accommodations can be provided.

Fenner, July 28.

SHASTA COUNTY.

The buildings which at one time constituted the smelter town of Keswick are being torn down and moved to be reconstructed at the new copper town, Coram.

TUOLUMNE COUNTY.

The properties of the Rawhide Gold Mining Co. have been assigned to George W. Ade, as trustee, for the benefit of numerous creditors. Ade is to manage the business, and whenever the indebtedness shall be paid the trust terminates. Mr. Ade was formerly manager of the Copper King Mining Co., in Fresno county. All of the employees of the App mine, at Quartz, have been paid. On the tenth day of each month hereafter, employees will be paid by draft. The company boarding-house in Quartz has been discontinued and employees will hereafter board and lodge wherever they choose. At present but 40 stamps are dropping in the App mill, but the entire 60 stamps will soon be in operation.—— The Atlas mine, near Tuttletown, has been unwatered, the shaft cleaned and straightened, and sinking is in progress. At this mine can be seen the most unique head-frame in the State. It is a pine tree 18 in. diam., to which the sheave wheel is attached. The cable runs from the engine to the wheel, then turns and runs at right angles down the shaft. ——A cave occurred last week in the Patterson mine, near Tuttletown, imprisoning Peter Johnson and Andrew Knudsen for a time. They were rescued by Mr. Davies, the superintendent. The work of cleaning out the south drift of the Patterson is progressing. They are in about 400 ft. Between there and the face of the drift a winze 70 ft. in depth was sunk 35 years ago, which will be cleaned out and prospected. Should the company decide to use the old shaft, pumps will be installed.

(Special Correspondence).—The Golden Rock ditch, built 25 years ago for mining purposes, but never used, is being cleaned out and repaired to supply water to the mines in the vicinity of Groveland. The work is well under way and will be finished before summer is over.——The company which has built an electric plant on the Tuolumne river will soon be supplying power to the mines at Big Oak Flat and about Groveland also, and operations are to be resumed at several of the mines. It is predicted that in a few months there will be greater activity in mining in that part of the county than at any time in the past. Among the mines that will be operated by electricity are the Longfellow, Mack, Mt. Jefferson, Del Monte, Cosmopolite and Nonpareil.——The mill at Sunnyside mine, southeast of Tuolumne, was started up today. W. P. Cunningham, superintendent, says sufficient ore is available for a steady run for several months.——A boring machine is being used at the Dondero placer mine, situated at Saw Mill Flat, near Columbia, to determine the depth of the gravel deposits and to prospect for new ones.——The shaft at the Santa Ysabel will be sunk 1,000 ft. deeper, which will make it 1,800 ft. deep. Nothing has been done at this mine during the past three months. E. C. Loftus, superintendent, recently made a trip to Massachusetts and induced the owners to advance sufficient money for carrying out the present plans; the work will be begun at once. For a long time, under a former management, good ore was taken from what is called the central shoot. From the grass-roots down to the 600-ft. level this shoot yielded well. At the 600 it faulted and was not found again, although much work was subsequently done. Should the Santa Ysabel again become a profitable mine as the result of the work to be done, much good is expected to follow, as other mines on that part of the Mother Lode in which similar conditions are found will be opened to greater depths.——The Mohican mine, near Groveland, at which work was recently resumed, is employing five men.

Tuolumne, July 20.

YUBA COUNTY.

It is reported that the Blue Point gravel mine, near Smartsville, is to be re-opened, after years of idleness. It is stated that before November water will be again running in the old Campbell ditch at Smartsville.

COLORADO.

CLEAR CREEK COUNTY.

W. E. Renshaw, manager of the Consolidated Gem Mines Co., has been sampling the medium and low-grade ore in the Gem vein, and has had tests made of the various classes of ore to determine how it could be handled at a profit; he says he has solved the problem. In all probability the Newton mill annex will be started with the addition of cyanide tanks. As it has been demonstrated that much of the value of the Gem ore is in the gangue rather than in the sulphide mineral, the silicious sand will be cyanided after concentration.—— The interest of the late E. F. Lougee, in the Lougee & Dill lease, in the tenth level of the Lamartine mine, has been purchased from the administrator by John Rohner. The block of ground lies below the adit level and was recently equipped with an electric pump and hoist.—— The Vidler tunnel is 10 by 12 ft. and is in over 1,300 ft. It is designed to reach West Argentine district and the Pacific slope of the continental divide. At the mill-site grading is nearly completed. Mr. Vidler says that driving on the Flossie vein will commence within 10 days.

CUSTER COUNTY.

At the Bassick mine the leases have been terminated and it is reported the pending deal will soon be consummated, and that a large force of men will soon be at work on the property.—— An extension of the King of the Carbonates vein has been discovered in an adjoining property on the north by J. E. Ray, of Westcliff.

EAGLE COUNTY.

In Eagle canyon a large number of the fissure vein properties are being worked. These veins in granite every year show improvement as development proceeds. The ore is complex, it contains gold, silver, lead, copper and zinc. None of the properties has great depth. In every case where work has been carried on, the veins are continuous. Development is by adits. —— The Maud S., under lease to the Minturn Mining Co., since starting six weeks ago, has a good showing of silver ore in the lower adit. On the hanging wall at the face a six-inch streak is coming in from the roof. Lead and iron also show in the bottom. —— C. M. Anderson and Martin Stall, after several months of development in an adit, concluded to sink a winze on a chimney that came to the surface. Twenty years ago Anderson had a sulphide shoot in the vein, considered at the time low-grade ore, and he opened this. In 65 ft. of sinking the sulphide was found. In a drift run 32 ft. the sulphide has opened to a four-foot vein. Samples assay 3 oz. gold. Ore on the dump will be screened and several cars shipped.

GILPIN COUNTY.

Johns & Co., of Nevadaville, lessees, in the 250-ft. west level of the Kemp-Calhoun property in Leavenworth gulch, have received returns of 9 oz. gold, 27 oz. silver and 4% copper, on a shipment to the sampling works at Black Hawk. Chicago people are interested in the property, which is under the management of George MacGregor.——Articles of incorporation of the Gold & Bismuth Mining Co. have been filed with H. D. Williams, F. R. Van Meter, F. C. Jones, L. G. Schwallenberg and H. G. Hunter, of Denver, as the directors for the first year. The company will operate in northern Gilpin county, and will have its main office in Denver.

LAKE COUNTY.

The new mill in Lackawanna gulch, in Twin Lakes district, is nearly completed. It has been erected on the site formerly occupied by an arrastra. —— Halleck & Funk have resumed operations on the Amazon lode. —— F. H. Minard, of Denver, has been inspecting the claims of the Twin Lakes Gold Mining Co., and it is reported that work is to be resumed. An adit will be started that will cut the veins 1,000 ft. deeper. It was to determine the feasibility of this project that Mr. Minard visited the mine.

SAN JUAN COUNTY.

The ground is broken and all the machinery ordered for doubling the capacity of the Sunnyside mill at Eureka. The mill, which now contains 40 stamps, will be enlarged to

80, and will then treat 200 tons of of ore per day. Other improvments are being made and the Sunnyside will soon have an up-to-date mill. The mill improvements will hardly be completed before the first of the year. The tram towers which were destroyed or dislodged by storms last winter are being replaced by Charles Dale, temporary towers taking the place of the permanent ones. For the past few months the mine has had very little interruption from steady work.

SUMMIT COUNTY.

The Orthodox mine, on Mineral hill, has been sold by the administrators for the estate of the late owner. This property has a production record of $200,000 to a depth of 200 ft. The property was bought by the Wellington Mines Co., which owns the adjoining territory. —— The Sallie Barber mine, on Bald mountain, one of the richest mines in the district, has been leased by the owners to E. E. Miller, of Breckenridge.——A party of Southern capitalists arrived in Frisco from Tennessee, Mississippi and Georgia this week, for the purpose of making an inspection of the property of the Mary Verna Mining Co. and the North American Mines Co. in Ten Mile canyon. They spent several days in looking after these holdings and also over other properties in the district. —— The main adit of the Square Deal Mining & Development Co. at Frisco is progressing, and the indications are that it will cut one of the veins in a short distance. The country rock is highly mineralized with iron, and small seams of quartz with disseminated galena are coming in. The president of the company is now at the mine with a party of visitors from Illinois and Wisconsin. —— The Monroe mines, adjoining the North American Mines Co.'s property in the Ten Mile canyon, have been leased and bonded to Conrad Hennick by the owners. This has been taken up by Denver men and is expected to be in operation shortly. This property has a splendid record of production in bygone years, when the ore from the main workings was shipped in carload lots and netted the owners $19 per ton, mostly gold.

Breckenridge, July 28.

IDAHO.

ADA COUNTY.

The Golden King in the Dixie district, which has lain idle for many years on account of litigation, is to resume operation. A great deal of work had been done and much ore blocked out before litigation stopped operations. The machinery is practically useless, having lain idle so long. The mine will be drained and put in working order and new machinery installed.——It has been settled that the Red Bird mine at Black Warrior will be taken by the Blue Cap Mining Co., represented by Ed Schwerd. L. W. Smith and J. Sebastian of Cleveland, officers of the company, have been inspecting the property. The company will take up the deal and work the property.

OWYHEE COUNTY.

The Portland group of mines, near Castle Creek, has been bonded to J. H. McGahn. These mines are situated 25 miles southeast of Silver City.

SHOSHONE COUNTY.

Official reports give the following concerning the value of the lead-silver ore in the Cœur d'Alene district and the cost of mining there in 1905. The Federal Mining & Smelting Co., which owns five mines in this district, extracted a total of 904,004 tons of galena, the value of which was $6.60 per ton, and the cost of extraction was $2.60 per ton. The Bunker Hill & Sullivan mine produced 342,414 tons of ore, the gross value of which was $3.40 per ton, costing $1.75 per ton to mine it. The Hercules Mining Co. produced 11,422 tons, valued at $82.59 per ton, the cost of mining being $11.41 per ton.——The Hecla Co. produced 97,366 tons, valued at $9.25 per ton, the cost of which was $4.10 per ton.——The Snowstorm, the only copper mine in the district, extracted 65,500 tons of ore at a cost of $2.52 per ton, and the ore sold for $12.74 per ton.

(Special Correspondence).—Markwell brothers announce that the galena vein has been found in the Sister mine near Wallace, 700 ft. from the adit on which the company has expended $20,000. It is low-grade ore, but can be concentrated.——W. S. Trasker of Chicago, of the Bear Top Mining Co. north of Wallace, says the mill is running 16 to 18 hours daily and turning out 100 tons of concentrate per month, which assays 65% lead and 5 oz. silver per ton. The capacity of the mill is to be doubled. The raise from No. 1 tunnel to the surface will be completed in a few days.—— Officers of the Idora Mining Co., of Spokane, announce a strike of five feet of milling and shipping ore in their property, samples running 50 to 65% lead and from 20 to 30 oz. silver. Some stoping has been done in No. 1 and 3 levels, the ore taken out being of high grade, and a large amount is ready for shipment. The Idora mine is in the Cœur d'Alene district.——The first shipment of ore from the Cœur d'Alene Consolidated mines, two miles east of Kellogg, will be made the last week in July. The property is near the Bunker Hill & Sullivan mine and consists of four claims. The main adit is now in 125 ft. and is headed for the junction of three lodes.——Shipments have been started from the Bluebird mine on the Blacktail mountains on Lake Pend d'Oreille, 42 miles northeast of Spokane, the ore being taken to the smelter at Standpoint. The ore is said to average $85 per ton.——C. M. Crego of Spokane, vice president of the Interstate mine, located near the Hercules property at Wallace, states that the company will install a 500-ton concentrating plant and a large compressor. The company has 22 claims and has expended $75,000 in development. The vein, which shows 75 ft. on the surface, has been broken into at 400 ft. depth in an adit.

Spokane, July 21.

MISSOURI.

CRAWFORD COUNTY.

Manville Jenks and J. H. Quinn have taken an option on the Baxter Lead & Zinc mine near Cuba for $600,000. The mine is now paying $9,000 per month.

NEVADA.

DOUGLAS COUNTY.

W. D. Kennedy, the discoverer of Buckskin, and one of the heaviest owners in the district, will resist the demands of the Western Federation of Miners, which has established a $4 and $4.50 scale in this camp. He says he will pay $3.50 and $4 per day, and no more. The Federation has appointed a committee to picket his mine and to send all non-union men from the district. Already several men have been sent out, their transportation being paid.

HUMBOLDT COUNTY.

In a new district, known as Seven Troughs, 25 miles west of Lovelocks, an important strike of gold has been reported, and men are said to be stampeding from every direction to this scene of Nevada's newest excitement. The find which created the initial excitement was that of a vein four inches wide from which ore was taken said to assay thousands of dollars per ton. The new field is in the low hills in Granite Springs valley.

The geology of the newly discovered mining region in the Pine Forest range, a short distance south of the Oregon line, is thus described by a miner in the new camp: "The formation is granite, lime and rhyolite, and the mineral zone can be traced for 10 miles. There are both wide and narrow veins, the richest ore occurring in seams in the latter. The grade of ore in the big veins is fair, but nothing can be said of the permanency of the ore deposits, for when I left the deepest hole was about 10 ft. There is no timber, and the water supply is limited, only what can be had in the draws. The country presents favorable conditions from a geological point of view. Some rich specimen ore is found, but the general run is from $12 to $20 in veins four to six feet wide, with seams in the orebody which carry ore ranging from $50 to $1,000 per ton. The camp may make a big producer, but it will take some time to really get even a fair idea of its possibilities."

LINCOLN COUNTY.

(Special Correspondence).—With the approach of the Barnwell & Searchlight railroad many mines are bettering their facilities, and preparing ore for shipment to the smelters.——The Duplex Extension, incorporated by the Pacific Coast Mines Bureau, of Los Angeles, is a new company, operating here. F. G. Tyrrell, its attorney, is here in connection with the title to the property, which was purchased from Allison & White, and consists of four claims, adjoining the townsite. Mr. Tyrrell states that his company will ope-

rate a mining exchange in Searchlight, under the name of the Broadway Mining Exchange.——A well-defined vein, four feet wide, with ore running $50 per ton, has been cut in the north drift of the 300-ft. level of the Cyrus Noble. The mine has found more water in its lower levels, 15,000 gal. being now available daily for milling purposes.——Cobalt is reported in the bottom of the Searchlight-Crescent shaft. ——Carter & Day have purchased the Searchlight-Diamond from Freeborn & Gehagan. It is stated that the interests of this property will be consolidated with those of the Searchlight-Western, which adjoins it.——George Weeks reports a new strike in the Newberry district, of a copper-stained quartz assaying high in gold. There are now more than 30 mines operating in Searchlight——Gillingham & Price, of the United Investors Co., New York City, are in Searchlight with a view to acquiring mining properties for their company. Mr. Gillingham states that he has practically closed a deal for the purchase of a well-known mine and has the acquisition of another under consideration.

Searchlight, July 28.

NYE COUNTY.

The miners of Goldfield and Tonopah have voted by a large majority to demand an eight-hour day, which if not granted will be followed by a strike, which would tie up all southern Nevada mines, including Tonopah, Goldfield, Manhattan and Bullfrog districts. The miners in the White Horse district decided on a new scale to go into effect December 1, and there will be no trouble in that section. It is said the Tonopah Mining Co. has agreed to the eight-hour schedule; but other companies are holding for a nine-hour day. A peaceful settlement is expected.

(Special Correspondence).—Lee Garrett is reported to have struck it rich on the Sedan claim which adjoins the Copper Farm of the Manhattan Nevada Gold Mines Co. on the north. He discovered the vein which others had passed scores of times. A sample across 12 ft. assayed $16 per ton gold. He purchased the property from the owners, and started to sink on this vein. At a depth of 15 ft. he struck 10 ft. of rich ore. Three assays at different points on this vein returned respectively $340, $570, and $1,508 per ton gold. At a depth of 30 ft. he started a drift under it, when he struck another vein 2½ ft. wide, heavily mineralized with manganese and iron, many pieces showing free gold. The 10-ft. vein is of a whitish color and contains free gold, a sample from which taken across 2½ ft. returned $200 per ton gold. Everyone owning property in the vicinity of the new strike is working hard to open up his ground. The Manhattan Belmont, to the southwest of the Sedan, has three feet of ore containing visible gold. The surface of the El Dorado claim of the Manhattan Nevada Gold Mines Co. pans gold, and work is to be started on this claim in search of the same vein. It is thought by some that this vein continues through the hill from the Sedan, across the Belmont and El Dorado claims, and into the Monday claim of the Original Manhattan Mines Co.——The strike on the Sedan, with the finding of rich ore by the Combination, Original Manhattan, and Paymaster Mining Co., has given a strong impetus to development in the western section of the Manhattan district. The management of the Manhattan Mammoth at East Manhattan has placed an order with the Fairbanks Morse Co. for a compressor plant for that property. This company has ore ready as soon as the mill is erected at East Manhattan.

The hoist on the April Fool claim of the Seyler Humphrey Gold Mining Co. is now in place, and will be in operation within a few days.——Free gold is being exhibited by A. H. Diehl, superintendent of the Manhattan Joker Mining Co. Dry washers are continuously at work on the Manhattan Cowboy Co.'s ground with good results.——A strike was made yesterday on the Manhattan White Caps, adjoining the Manhattan Mother Lode on the north, and close to the latter company's line where a four-foot vein was uncovered that assays $60 per ton gold.

Manhattan, July 28.

UTAH.

BEAVER COUNTY.

The Majestic Copper Mining Co. has recently installed an electrically driven pump having a capacity of 150 gal. per minute. At water level in the Majestic mine, a vein of lead-silver ore was found, and in cutting out for the pump high-grade copper ore was uncovered.

GRAND COUNTY.

There is more development work going on in La Sal district than ever before. Three properties are shipping ore, and the Basin stamp-mill is ready for operation. The camp of Basin is growing rapidly, new people coming in every day. The lateness of the season this year kept everything back until the first of July, and while there is still much snow on the north side of the mountains, work is going on. The Basin stamp-mill has been remodeled to treat the ores of this camp.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—Eastern stockholders of the Sagamore mine are here inspecting the property, of which L. P. Woodbury is manager. —— E. C. Johnson, who sold the Gertie tin mine, has returned to Hill City from the East to resume active mining. —— The Westinghouse Electric Manufacturing Co. has 90 people on the pay-roll.

Custer, July 24.

PENNINGTON COUNTY.

The Westinghouse Electric Mfg. Co., which recently bought the New York mica mine, near Custer, and established a factory there for preparing the product of the mine for use in the works at Pittsburg, is making arrangements to increase the capacity of the plant. The Westinghouse works require 400 lb. of mica splittings per day, but at present the output of the Custer branch is but 300 lb. per week, and W. J. Longmore has been making arrangements for a larger force to increase the output to the desired amount. New machinery for the factory has been ordered, and 175 additional boys and girls, 14 years of age and upward, will be given employment if they can be secured. At the mine everything is being arranged for continued operation upon a large scale, and the latest orders received have been for the construction of a boarding-house for the men, residence for the foreman, machinery and equipment.

CANADA.

BRITISH COLUMBIA.

Following is the tonnage of ore shipped from, and crushed at, the mines of Rossland for the week ending July 28: Centre Star, 2,430; Le Roi, 3,120; Le Roi Two, 630; Total, 6,180; Total for year, 183,779. —— Ore shipments from Boundary mine for week ending July 28 were as follows: Granby mines, Phœnix, 15,829 tons; British Columbia Copper Co., Deadwood, 450; Dominion Copper Co., Brooklyn-Stemwinder, Phœnix, 2,904; Rawhide, 396; Sunset, 904; Mountain Rose, 70; Emma, Summit, 330; Providence, Providence, 140; Skylark, 60; Total, 21,083 tons. Total for 1906 to date, 703,720 tons. Smelters treated ore as follows: Granby Co., 16,602 tons; Dominion Copper Co., 4,274. Total for year to date, 708,352 tons.

ONTARIO.

(Special Correspondence).—The country north of the Cobalt silver district, between Lake Temiskaming and Lake Abitibi, is full of prospectors searching for any kind of mineral that may exist. Mr. Wilson, of the Canadian Geological Survey, is making a preliminary survey of the region north of the National Transcontinental railway.—— It is reported gold has been found in the black sand of the Croche river, which flows southerly into the Saint Maurice, at La Tukue. An old Colorado miner, named Hayes, panned the sand and found gold. Samples assayed about $1 per ton. A New York company has taken up 500 sq. m. for the purpose of prospecting, and sent an engineer into the district who reported that there was little or nothing found. Hayes since reports that he has discovered the principal gold-bearing lode of the region. The New York company has an agent on the property and an assayer is kept busy testing samples brought in from tis land.

Cobalt, July 28.

Personal.

HENNEN JENNINGS is at Berkeley.

A. H. ACKERMANN is in Rhodesia.

O. B. PERRY is at Dawson, Alaska.

S. F. PARRISH is now living at Los Angeles.

R. C. CANBY is taking a holiday in Connecticut.

C. REGINALD ENOCK is visiting England from Peru.

H. C. HOOVER left London for New York on August 3.

GEORGE W. MAYNARD is examining mines in Georgia.

H. H. CLAUDET has returned to Rossland from London.

E. F. DE LANO is at Los Angeles from Fenner, California.

C. R. CORNING sailed from New York for Europe on July 25.

H. KILBURN SCOTT has returned to London from South Africa.

ARTHUR L. WALKER has returned from a flying trip to Cananea.

JAS. W. NEILL is at Merced, Cal., inspecting dredging ground.

E. ALEXANDER is in San Francisco, on his return from Manchuria.

F. H. MINARD has been examining mines near Twin Lakes, Colorado.

ROWLAND F. HILL, of New York, is examining mines at Pulaski, Virginia.

W. H. WEED is examining the Nickel Plate mine, in British Columbia.

HUDSON H. NICHOLSON is visiting Goldfield and the new mining camp of southern Nevada.

C. J. ADIMI has been appointed general manager for the Cable Consolidated Co., in Montana.

JOHN ROSS, JR., has gone from Sutter Creek, Cal., to Grants Pass, Or., on mining business.

LEONARD S. AUSTIN, professor of metallurgy in the Michigan College of Mines, is in Colorado.

DANIEL GUGGENHEIM left Vancouver on July 31, to inspect his company's holdings in Alaska.

H. L. SLOSSON has returned to San Francisco from New York and has left for Virginia City, Nevada.

H. G. SCHRADER, recently superintendent of the Johnnie Con. Gold Mining Co., is now at Los Angeles.

S. S. FOWLER has been appointed manager for the Canadian Metal Co., Ltd., at Frank, in Alberta, Canada.

W. E. RENSHAW, manager of the Gem Consolidated mines at Idaho Springs, Colo., has gone to Pittsburg.

E. C. LOFTUS, superintendent of the Santa Ysabel mines, near Stent, Cal., has returned to the mine from Boston.

W. J. ALSTEAD has returned to Seattle from Chettana, Alaska, where he has been inspecting copper properties.

A. M. ROCKWELL has become superintendent of the Bonanza King mine in San Bernardino county, California.

R. L. LLOYD, chief of the reduction department (mills and smelters) of the Greene Consolidated Copper Co., has resigned.

C. J. PRICE, on a visit home from Johannesburg, delivered an address before the Black Hills Mining Men's Association on July 19.

FRED HUTCHINSON and P. BELL, of North Queensland, Australia, are in San Francisco. They leave for Australia on August 16.

A. M. ROCKWELL is superintendent of the Bonanza King mine, in the Providence mountains, near Fenner, Cal., for the Trojan Mining Co., lessees.

T. A. VARDEN, in charge of the Uncle Sam and other mines, is now living at North San Juan, in Nevada county, California.

GEORGE A. GUESS, chief chemist of the Greene Consolidated Copper Co., has been appointed chief of the reduction department.

FRANK J. BOOTH, superintendent of the Mexican Gold Copper Co., has returned to the mines at Colonia Juarez, Mex., from Berkeley.

CHARLES BUTTERS has been awarded, by the Institution of Mining & Metallurgy, London, the gold medal in recognition of his researches in the extraction and treatment of gold ores.

JAMES CRONIN, of Spokane, who discovered the St. Eugene mine at Moyie, B. C., has resigned as manager of that property and of the Centre Star mine at Rossland, B. C., and will make a tour of Europe.

GEORGE S. WATERLOW, of London, vice president of the Snowshoe Gold & Copper Mining Co., is in British Columbia for the purpose of completing negotiations for selling the property to the Canadian Pacific railway.

E. C. GARDANIER, of Salt Lake City, has gone to Phœnix, B. C., where he is superintendent of the Dominion Copper Co. mines, relieving THOMAS R. DRUMMOND of part of the work. Mr. Gardanier was formerly with the Highland Boy mine at Bingham, Utah.

IN steam pumps there are two completely antagonistic elements to be reconciled, namely, the steam, an elastic expanding vapor at one end, and the water, an inelastic, non-compressible fluid at the other. In moving the water, an effect must be obtained as near absolute uniformity as possible, while, to secure the greatest economy of steam, it is necessary to produce the widest practicable variation of pressure upon the steam-piston. It is obvious that some means must be provided within the engine to equalize these widely different demands, either by the use of heavy fly-wheels, or by compensating cylinders, as in Worthington high-duty pumps.

IT is a common belief among miners that the grain of galena is influenced by its richness in silver, the general idea being that a coarse-grained galena is likely to be poor in silver, and a fine-grained variety, rich. While no general rule can be laid down, nevertheless, as regards certain districts, some connection is observable between the grain of galena and its silver contents. Thus, at Broken Hill, Australia, the coarse-grained galena is said to be generally richer in silver than the fine-grained. In Mexico, the contrary rule prevails as regards the ores of a particular mine, namely, that the fine-grained galena is the highest in silver.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

New York, Boston and London, August 1.

Amalgamated	$103	Standard	$ 2
Anaconda	258½	Tonopah Ex.	5.75
Bingham	32	Trinity	9
Calumet & Hecla	700	U. S. Mining	56¼
Copper Range	74¼	Utah Copper	58½
Daly-West	16¾	Wolverine	153
Granby	11⅝	De Beers	£17⅛
Ontario	2.65	Rand Mines	£ 6⅛

ANGLO-AMERICAN SHARES.

Cabled from London.

	July 25. £ s. d.	August 2. £ s. d.
Camp Bird	1 4 0	1 4 3
El Oro	1 5 3	1 11 0 ex. div.
Esperanza	3 15 7½	3 11 0 ex. div.
Dolores	1 18 6	1 18 9
Oroville Dredging	0 17 0	0 17 0
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 4 3	1 4 4½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending July 26.	Average Prices for Week Ending August 2.	Average Prices for Month of July.
Copper—Lake (cents per lb)	18.50@18.62	18.55@18.70	18.61
" Electrolytic "	18.02@18.27	18.20@18.35	18.19
" Casting "	17.87@18.00	18.00@18.01⅛	17.99
Lead "	5.75	5.75	5.75
Spelter "	6.03	6.03	6.01
Silver (cents per oz.)	0.65⅜	0.65	0.6505

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

GRAPHITE, unless of good quality, free from earthy or other impurities, is not in demand on the Pacific coast. A very large amount of artificial graphite is now produced for those purposes not requiring the best amorphous or crystallized mineral, and the cheapness of the manufactured article bars out the poorer natural product.

THE minimum interval of rest which should be allowed a stamp, on striking the die, is one-tenth of a second. If the speed of dropping is such as to give a less interval, then breakages will occur, beginning with the arm of the cam.

WOLFRAMITE, HUBNERITE AND SCHEELITE are the three minerals from which tungsten is derived for the making of a special steel. Tungsten was formerly used chiefly for making colored cotton goods 'fast' or washable. Its metallurgical properties have given it a greatly increased commercial value.

CALIFORNIA TURQUOISE.—The turquoise mines of New Mexico and Arizona have lately not been as productive as formerly. The turquoise properties of California and Nevada have, however, been increasing their output. Considerable quantities of turquoise have been taken from the mines in the desert region of San Bernardino county, Cal. Many of the stones range from 50 to several hundred carats in size. Some of them have sold as high as $1,500 each. The color is pale, but it has gained favor.

IN CALIFORNIA the float from veins and mineralized zones, as far as known to us, lies on the lower side of the outcrop, and its position in every instance may be assigned to the forces of gravitation. Possibly there may be a few local exceptions in the Sierra, where float has been carried up hill by ice. The fact of float, and gold also, being scattered on hillsides below outcropping veins is a fact made practical use of by experienced pocket hunters and intelligent prospectors generally.

IT IS TRUE that fabulously rich placers have been found at intervals from the Arctic ocean southeastward through Alaska and British Columbia and again through the State of California as far south as Calaveras county, but rich placers have also been found in Tuolumne and Mariposa counties, in Kern county and in Arizona. The absence of extensive rich placer diggings in Washington and Oregon, and in portions of California, is due to either the absence of rich veins in the bedrock, or the placers are concealed beneath vast accumulations of lava and have never been discovered. In southern California large gravel deposits, undoubtedly occupying the beds of ancient rivers, are found in the San Gabriel and San Bernardino mountains at elevations ranging from 7,000 to 10,000 ft. above sea level, and the gravel has been worked for the gold it contains but is only rich where concentrated in narrow gulches crossing the older deposits. Near Newhall, in Los Angeles county, there are several square miles of gold-bearing gravel. In San Diego county there is a peculiar ridge near Ballena. It resembles the back of a huge whale, whence its name, *ballena* being whale in Spanish. This ridge is wholly composed of auriferous gravel, consisting of material all foreign to the locality, nor is it known where it had its origin. It is merely a remnant of an ancient river, the greater portion of which was long since removed, by the ordinary process of erosion, or possibly, in part, by ice.

URANIUM is now increasingly used in photography. The nitrate of uranium serves, in conjunction with sulphocyanide of ammonium and ferricyanide of potassium, the purpose of intensifying an undeveloped plate. The same salt is also used to get the red glow effects in lantern slides.

GLACIATION IN CALIFORNIA: How far south the great ice sheet of early Quaternary time extended it is impossible to say, as the vast erosion to which the greater portion of the State has been subjected removed all traces of glaciation, including moraines, except from the high Sierra. Le Conte says, in 'Elements of Geology': "During the fulness of glacial times a continental ice-sheet covered the whole of British Columbia, Northwest Territory, and Alaska, connecting in high altitudes with the eastern sheet. * * * * The ice moved southward, southwestward, westward, and even northwestward. Southward it certainly reached as far as latitude 48 degrees, westward it flowed over the Coast range, filled the valleys (now submerged) separating the great coast islands from the mainland, flowed over these islands, and ran into the sea beyond. At the same time it is certain that the Sierra was completely mantled by snow; and great glaciers, some of them 40 to 50 miles long, filled all the profound canyons which trench its flanks. At the same time, also, there is some evidence that even the Coast range, favored by proximity of the sea, had their perpetual snow-cap from which issued glaciers filling the principal valleys." He adds, in a foot-note: "Undoubted marks of ancient glaciers are found about Berkeley, 300 ft. above the bay." This undoubtedly refers to striated rocks found in the open fields north of the city of Berkeley. Some geologists dispute this evidence, assigning the stria to other causes. Some of them are undoubtedly due to rock movement (slickensides), others appear difficult of explanation by any than the glacial theory.

A REVERBERATORY FURNACE may be built of *adobe* and stone. *Adobe* or sun-dried brick used for this purpose should be made of suitable earth—that is, must contain sufficient clay. Straw should be used in amount just sufficient to hold the brick together. They should be 9 in. wide, 18 in. long and 4 in. thick, this being a convenient size. The binding mortar should be of the same material as the *adobe*. The walls should be three feet thick. The foundation may be made of stone and the buckstays may be made of 10 by 10-in. timbers, held by iron rods. The *adobe* for the arch should be built to fit, and if material is not available for making a form to sustain the arch while in construction, fill the furnace chamber with loam or sand, crowning the top to the desired shape, then place the *adobe* in position, using as little clay or mortar as possible. When in position they should be carefully hammered into place with a block of wood. When finished the sand may be removed from the chamber and after the placing of the stays the furnace is completed.

THE OCCURRENCE of galena, associated with other sulphides in quartz, may be indicative of the presence of silver, but in some districts it is distinctly an indication of an increase in gold. Native gold is occasionally seen in crystals of galena, though not commonly. Likewise, the appearance of zinc-blende may indicate an increase in either gold or silver in an ore, as in California. In some districts zinc-blende is a sure sign of impoverishment.

PRACTICAL LIFE is a Rule of Three sum, in which your duty multiplied into your capacity and divided by your circumstances gives you the fourth term in the proposition, which is your deserts, with great accuracy.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Pans vs. Tubes.

The Editor:

Sir — It has occurred to me, in the case of many of the controversies over the respective merits of grinding pans and tube-mills, that no real basis for argument would be left if more attention were paid to defining the work to be performed by each machine. For instance, is total sliming of the ore the principal consideration, or is sliming only to be the final stage in the crushing process?

In the Transvaal, total sliming — or at least total fine grinding—of the stamp-mill product seems to be the desired end, while in Kalgoorlie stamp-mill practice total sliming is wanted only after a preliminary concentration has been effected. Both grinding pans and tube-mills are in use here, and each fills satisfactorily its own position in the scheme of treatment. The introduction of the grinding pan into the milling practice of Western Australia was undoubtedly due, in the first place, to a desire to lower the treatment costs in wet-crushing mills, which were using the bromo-cyanide process on sulpho-telluride ores. Its success in this particular function has led to its development as a grinding machine pure and simple on many different classes of ores. The conditions which introduced the pan were:

1. A high consumption of a high-priced chemical, namely, bromo-cyanide.

2. The knowledge that in this respect expenditure could be most easily reduced by eliminating by concentration as much of the gold as possible before treatment with bromo-cyanide.

3. An ore, the valuable portion of which was most susceptible to sliming.

4. The necessity of reducing the crushed ore from the stamps to a size which would free the mineral particles for concentration, with the creation of a minimum percentage of slime.

These conditions seem somewhat contradictory, inasmuch as good concentration practice demands that the mineral be saved in as coarse a condition as possible, while on the other hand a high extraction from the roasted concentrate demands that all mineral particles be crushed sufficiently fine to free them from enclosure in gangue material. It is, however, this very conflict of demands which has made a place for the grinding pan, the construction and operation of which renders it possible to regulate with some accuracy the size of the product which it discharges.

While stage grinding, as a preliminary to concentration, is the work for which the pan was originally introduced, its field of usefulness is by no means confined to this particular duty. Its efficiency as a fine grinder is being steadily demonstrated, and the limit to which fine grinding in pans can be carried is not yet in sight.

In regard to sliming of the total stamp-mill product, it seems by no means settled whether stage grinding in pans with final sliming in tube-mills, will not prove more economical than direct sliming of the whole product in tube-mills. There is no doubt, however, that as an adjunct to a stamp-mill for the purpose of giving increased efficiency to the stamps by allowing the use of coarser screens, the field for both these machines, used in combination with each other, is a wide one.

It is the successful development of the grinding pan which has enabled the wet-crushing mills at Kalgoorlie to survive the increasing competition of the dry-crushing and roasting mills; and it has been the chief factor in increasing output and decreasing costs of the stamp-mills at the quartz mines outside of Kalgoorlie.

D. P. MITCHELL.

Kalgoorlie, June 9, 1906.

A Mining Method Wanted.

The Editor:

Sir — New Superintendent has brought out some valuable ideas in connection with his query for a mining method. To discuss the subject further, a few additional points of information are necessary. For instance, his description of the orebody is vague. Does it stand well, or is it broken up or brecciated, and does it 'cement' on exposure to air, as do many of the desert deposits? This point, combined with the value of the ore and the profit per ton, will determine whether it is good mining to extract the whole orebody, or whether pillars should be left to support the roof or hanging wall. To mine waste from raises and drifts, for filling, may more than counterbalance the profit to be derived from robbing pillars. The site of the mill, whether above or below the adit, will, I think, determine the expediency of a shaft in the foot-wall. I think the expense of artificial ventilation would more than offset the difference of cost for a shaft, or a raise, in the foot-wall — should this be necessary — particularly as all the schemes submitted thus far start to stope from the adit-level upward.

From the data furnished, Mr. Nickerson's solution appears to me to be the most practicable, except that to supply enough filling, the top of the raise A F should be continued on a 50 deg. incline to a 'glory hole' on the surface, where waste could be mined at a minimum cost and drawn out where desired.

ALGERNON DEL MAR.

Enterprise, Cal., July 26, 1906.

Mining Quacks.

The Editor:

Sir—We are all familiar with the medical quack and we know that, in most places, he is outside the pale of the law, and although most of us are acquainted with the genus mining quack, the latter not only exists, but does very well out of a gullible public. The legitimate members of the profession are perhaps powerless to restrict the fraudulent mining engineer, but when all's said and done, why should it not be illegal for a man to call himself a mining engineer unless he has earned that degree by a course of study? There are many men who have not had the advantage of a college training, who through sheer ability have risen to eminent positions, and while the restriction mentioned might unjustly affect a number of worthy men, without doubt it must eventually tend toward greater protection to the investing public, beside giving to the title a greater significance than it now possesses. The only hardship it can work is to cause a comparatively few men either to pass certain examinations or drop a handle they are not entitled to.

It seems to me that legitimate mining engineers do not take any pride in the appellation, with the result that the mining quack is much in evidence in every mining community. The individual of this type—usually an ex-day's pay man—loves to use a multiplicity of high-sounding technical terms, especially those relating to geology, and he further has a great partiality for that particular form of ore deposit known as the fissure vein. Further, he is very partial to a double-barreled degree such as 'Mining Engineer and Geologist,' or 'Mining Engineer and Metallurgist.'

In my time, I have seen some gems in the way of literary composition, but I think the one herewith is quite a curiosity, and in its way, worthy of Mark Twain. I

am sure every mining man will appreciate the humor of it. Does it not seem a pity that a man who is paid a fee for writing such a report cannot be put in jail for fraud?

[The report is bad, but not worse than many we have seen; so we quote only two paragraphs.—Editor.]

"The slate on the hanging-wall side of the lode area is metamorphic on altered slate, hard silicious carrying quartz veins, and highly mineralized. The strata on the foot-wall is chiefly metamorphic slate, with in places an intrusion of felsitic rock, and plumbiferous slate with calcite disseminated through the slates. The whole stratification is crushed and fragmentary, and probably will not be settled until a depth of 500 feet.

"Is nearly north and south—a true fissure lode trending through a belt of mineralized rock, which by its appearance and constituents should extend for miles. The lode trending through the belt, incased by different stratas, renders it a contact vein, so that in the double capacity of a true fissure and contact lode, there is an assurance of permanency and value in depth, and I also premise that the size of the lode would be larger and more regular in depth."

This type of individual, as a class, is a menace to the public. He may, through being successful in some particular instance, have acquired a following, but what does he, as a usual thing, know of mining engineering? If he were prohibited the use of the title 'Mining Engineer,' he might adopt that of 'Mining Expert,' and we could then have him safely labeled and more or less out of harm's way.

There is another variety of mining quack who plays the comparatively safe game of reporting unfavorably on ninety-nine mines out of one hundred he visits. This class of individual is shrewder than the optimist typified by the charlatan just quoted, but the mainspring of his pessimism is controlled by fearfulness of results, owing to a lack of knowledge of the problems involved, and as his instinct of self-preservation is very strong he rejects a proposition sooner than shoulder the responsibility of recommending it. He knows that a mine once turned down always has more or less of a stigma attached to it, and he feels that this is apt to exercise some influence with the next man that comes.

Australia is the home of the mining quack; they grow on bushes there. Mining schools are in their infancy, and as mining is an active industry, very naturally a demand exists for reports for intending investors. There being practically no school-of-mines men, the quack has had to fill the gap. These men have sprung from all ranks of life; some of them have worked in mines, some are ex-sailors, and then there is the newspaper reporter.

One of the most flagrant cases of company mismanagement and unfulfilled promises known to the London mining world is that of the Etruscan Copper Estates. This company spent about half a million pounds sterling on a wild cat on the advice of a quack who learned his mining while writing for the mining columns of a daily paper. These ex-newspaper men are a particularly pernicious set. On account of their writings they get well known, and writing with a facile pen they fill their articles with glittering generalities and safe prophecies, which they get out of other men's mouths, and only the man who has an intimate knowledge of the mine or district they are describing, can detect their fallacies. It is marvellous how few people, even among those who have sufficient knowledge, stop to analyze what they read. Or, on the other hand, figures and information are given, and it is taken for granted they are correct. No matter what a man knows, to be useful as a mine examiner, he must be able to write a readable report, and that is where the newspaper variety of mining quack has the advantage over his less fortunate, though perhaps more capable fellow quacks who have no 'larnin.' I think we should recognize these men in some manner, and label them for identification, say, by giving them the degree M. Q.

VIATOR.

London, July 13, 1906.

Salton Sea and the Climate of Nevada.

The Editor:

Sir—It would be well for the desert country north from the Salton Sea if that inland lake were allowed to remain, and the inflow from the Colorado river allowed to continue.

During the present month it has rained every day in the vicinity of Lida, Esmeralda county. At Goldfield there have been showers almost daily, and rain-clouds are in sight at all times now, and have been for a month past. The result is that Goldfield is almost a summer resort. The temperature seldom gets above 90 deg. in the shade, and the nights are cool and pleasant. Last year, at this time, we occasionally saw clouds, but we had no rain. It appears that the prevailing southwest winds bring the clouds, laden with moisture from the evaporation from the Salton Sea, and these clouds give the rainfall, which if continued, will in time change these dry hills and plains to a fertile country with a different climate to what it has had in the past generation.

The sunsets in Goldfield, with the cloud effects, would delight any artist, and it is doubtful if they can be excelled anywhere for brilliancy and coloring.

ALBION S. HOWE.

Goldfield, Nevada, July 19, 1906.

USE OF FIRE-CLAY.—An experienced furnace builder and fire-brick manufacturer has the following to say of fire-clays:

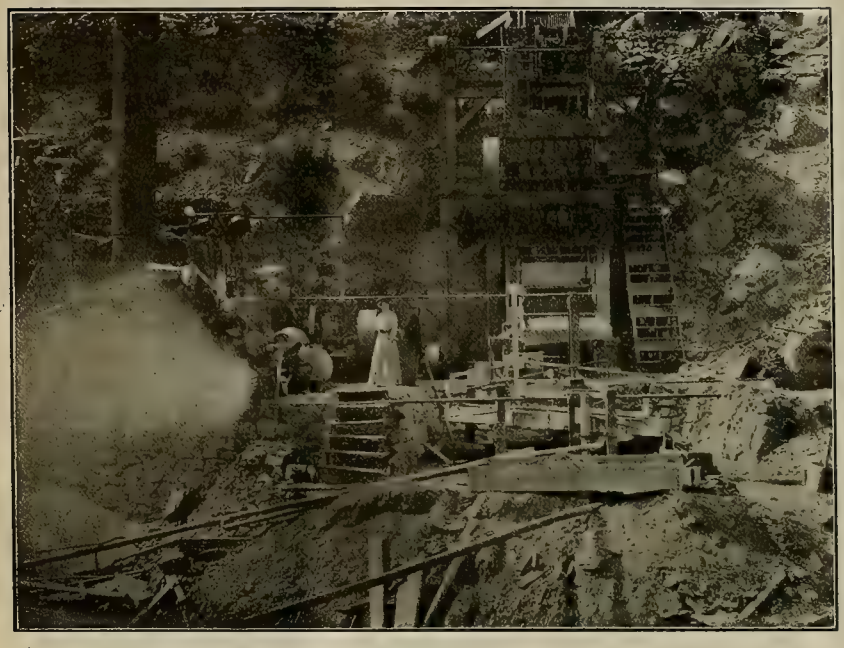
Fire-clays are as numerous as their uses are varied, and prices differ according to quality. In exceptional cases only is much consideration given to the efficiency of the material; the main question being, apparently, cost per ton without regard to its refractory qualities. We find this verified every day in works where the very best fire-brick are used, yet they are laid with mortar made from the poorest and cheapest fire-clay on the market; the result is the burning out of the mortar in a little while and opening of joints, allowing the flame to cut away the bricks, which would last very much longer if laid with good fire-clay. When a furnace is to be repaired, the items of labor and material necessary for repairs are very small in comparison with loss of production resulting from the closing down of the furnace, and for this reason, if for no other, it is poor economy to use cheap mortar-clay with which to lay high-grade fire-brick or silica-brick. If a purchasing agent, mill manager and furnace builder were offered a brick made from a common clay, with the assurance that it would give as good service as one made from what is known as the Pennsylvania flint-clay, the person making the claim would be simply laughed at; at the same time they are buying these common clays with which to lay their No. 1 brick, and it is difficult to convince them of their error.—*The Industrial World.*

A METHOD of amalgamating in rotary mills of the Bryan type is recommended by an authority as follows: First, use enough quicksilver to keep the amalgam liquid, thus allowing it to accumulate in the annular space between the dies and the rims of the basin; secondly, to replace the old dies, when a little more than half worn out, with new ones; and, thirdly, to clean up the mill at least every two weeks — or oftener, if rich ore is being treated.

Experiences in Stamp-Mills.

Written for the MINING AND SCIENTIFIC PRESS
By ALGERNON DEL MAR.

Most articles on milling deal with mills that are treating ore under the particular conditions that have proved by experience to be the best for that particular ore, and we seldom hear of the experiences of those milling operations that have turned out failures, either through lack of funds or through ignorance of first principles.

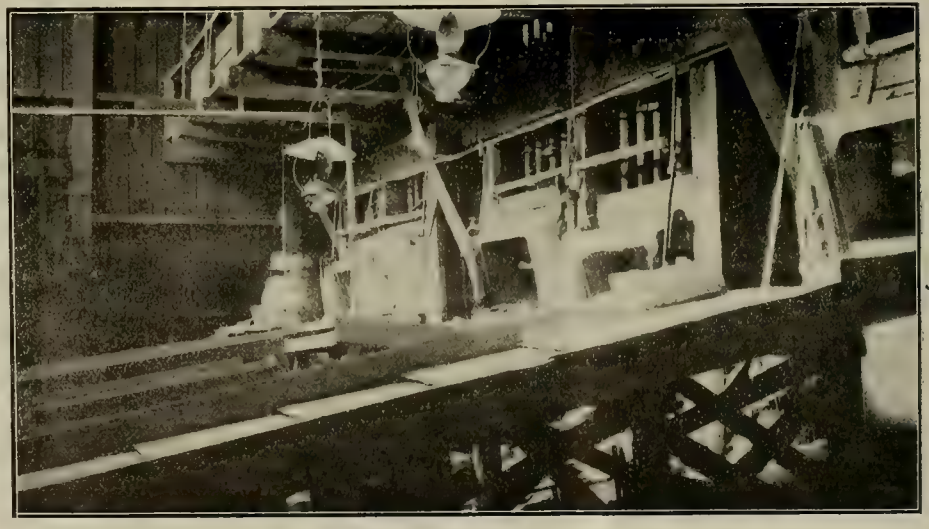


A Stamp-mill Out-doors.

The mill being the heart of a mine, it should be treated as such; it should be of the best workmanship throughout and should never be allowed to deteriorate, for once wear starts, either from a loose nut or a bent rod, the efficiency of the battery soon suffers.

A certain Nevada corporation installed a five-stamp mill and concentrator, but they failed first to obtain a constant supply of water and, secondly, they were in such haste to get rich that they failed to cover the building. It is needless to say that the mill never produced enough to pay for a housing, not through lack of gold in the ore, but through lack of conditions favorable to efficient work. The water was only sufficient for a 12-hr. run and had to be pumped back, in a more or less slimy condition most unfavorable for amalgamating fine gold, and the result of the mill being uncovered was that in cold weather all pipes had to be blown out with steam every night and it required at least two hours every morning to start the machinery. The small expense of covering the mill would soon have been paid by increased extraction and time saved, for the main expenses were going on when the mill was idle and the cost per ton increased accordingly, putting out of consideration orebodies that could otherwise have been worked at a profit. Some mornings the plates and even the battery had to be thawed out with hot water and during the day the heat was sufficient to cause quite a variation in the consistency of the amalgam. Singularly, this extreme change of temperature did not appear to harm the silver plating, principally, no doubt, because a thick, firm coating of amalgam was allowed to remain on the plates. This coating protected the plating and allowed some variation of consistency due to change of temperature.

Another Nevada corporation erected a mill that was run by steam, the boiler being of the locomotive type with no masonry. The assayer returned an analysis showing the water to contain about 20% of solid matter, principally common salt. The mill, consisting of only five stamps, the millman had to fire the boiler. To facilitate the removal of salt from the boiler, a top and bottom blow-off was provided. The theory is that the salt will rise to the surface instead of, as one would suppose, sinking to the bottom. At all events the boiler was blown off every half hour. This excessive amount of saline matter did not cause foaming, but it formed a deposit in the injectors, soon putting them out of commission, and the least possible leak around the rivets of the boiler became so enlarged that huge coatings of rock-salt formed wherever such leaks took place. Salt was even carried with the steam into the cylinder of the engine. It became so difficult to keep up steam that the millman had to be stoker. By emptying the boiler every other day and filling with good water an improvement was noticed.



Mortar Sunk in Cement.

A trial was made with the lignite coal that outcrops about 18 miles from Tonopah. This cost $18 per ton delivered at the mill, while wood cost $7 per cord. This coal proved a failure, for steam could not be kept up at all. The coal would burn with a fierce heat when first put in the fire-box, but it would soon cake to a sticky mass that would prevent the air from entering. A forced draft did not improve matters. In half an hour the fire-box was a mass of clinker. With a moving grate mechanically fed it might answer, but this coal could not compete with pinon wood at any reasonable ratio of cost.

The old millmen in Plumas county were fond of having as many stamps as possible on a cam-shaft, as witnessed by the monuments all over the county. It was common to have twenty on a shaft. Considering the tendency toward the opposite extreme at the present date, an experience with one of these old mills is quite an adventure, especially in the year 1905 or 1906. The particular mill referred to had 15 tappets on the cam-shaft, with no mechanical means of setting a tappet readily except by hanging up all the stamps but the one to be set, and revolving the cam-shaft until the tappet had reached its position on the stem. That a tappet could be set while all the other stamps were dropping was something quite unheard of and was not considered practicable, so an overhead crawl was not installed, but at least an hour a day was lost for the whole 15 stamps.

The system of amalgamation was to allow the silvered plates to harden, scrape with a chisel at the end of the month and then wait two weeks for the plates to get in fair condition again. When new silvered plates were put in and it was recommended to amalgamate in the usual way, it was pointed out that so and so had made a successful extraction with raw copper plates. Now everyone who has had experience with copper plates will have noticed the difference physically between a raw copper plate and electro-silvered plates that have had the silver worn off. Whether this difference is due to a physical change caused by galvanic action, the effect is to make a worn-off silvered plate a poor amalgamator while the soft raw copper with proper care gives good service. This explains why it is so difficult to keep a worn silvered plate in good condition and shows the importance of a careful study of the amalgamating conditions so as always to keep the silvered plates from showing copper. Some ores contain chemicals sufficiently strong to attack silver even if protected by amalgam; in such case raw copper plates may be of benefit, but otherwise the electro-plated coppers are more efficient.

The importance of keeping a mill in thorough repair was well exemplified in the case of a mill in southern California. This mill was allowed to run down so badly that no millman would take hold of it without a premium. But for the haste of the management to obtain a big tonnage and consequent low cost, the mill, with a small outlay, could have been kept in good condition and in the end the cost per ton would have been less. Carelessness in keeping the guides in order led to most of the trouble. The fact that the mortars had no housing or covering on top was due to the same cause, for the guides being worn so that the stems had an inch or more play, the stamps had so much lateral movement that a covering over the mortar was almost an impossibility. The tappets and shoes hit, causing them to loosen, so that to keep the 20 odd stamps going required the millman to be on the jump every minute of his 12-hr. shift. There being no protection from tappet-keys dropping into the mortar, broken stems were of frequent occurrence. The claim put forward was that the iron guides were of no use and wore out in a short time, but the fault was in allowing them too much play to start with and in not keeping them in place afterward. The concrete mortar-blocks proved a failure in this mill, no doubt because the nuts of the mortar-bolts were allowed to loosen and, once the least movement took place, the deterioration was rapid and complete.

An experiment with rolls may be of interest. An ore containing 20% of partially oxidized copper pyrite was run through the rolls with a stream of water, screened and concentrated. This process proved a failure by reason of the action of the copper salts and free acid on the screens, and all iron or steel with which it came in contact. That the rolls and screens could have been operated dry, and the crushed material mixed with water before concentrating, had not been considered.

That a stamp-battery was more favorable to the amalgamation of the gold was evidenced where a dry-roller mill was replaced by a stamp-mill. The ore, after being crushed by the rolls, was mixed with water and run over silvered copper plates, giving an extraction of a little over 50%, while the same ore treated in the stamp-mill yielded over 80 per cent.

Cement and Clay.—The quantity of portland cement used in California is far in excess of that manufactured in the State. With large deposits of limestone and clay quite widely scattered through the State and a large fuel supply, it would seem that the cement industry ought to increase rapidly. The State should be exporting rather than importing cement. For many years the development of the cement industry, like many other manufacturing industries in California, was hindered by the high price of fuel. With the opening of great oil-fields this difficulty has been overcome. Three cement factories are reported to be in operation, situated, respectively, at Napa Junction, Colton, and at Cement, near Suisun. The oldest factory is at Colton. The one at Suisun began operations in 1902 and the one at Napa Junction in 1903. The clays and the clay industries of this State are also important at this time. Large works are operating in Alameda, San Joaquin, Amador, Calaveras, Contra Costa, Kern, Los Angeles and other counties. Immense deposits of clay were discovered by the San Francisco and San Joaquin Coal Co. in the opening up of coal deposits at Tesla. The mines will supply a fine grade of pottery and fire clays. In the area about Carbondale, Amador county, and between Carbondale and Ione, there are extensive deposits of high-grade clays. Clay is found in a massive bed, 18 to 20 ft. thick, on the Ione-Sacramento road. There are many clay deposits of varied character in Butte county. Fire clay was discovered in Calaveras county in beds that overlie croppings of copper ore. Stewartsville, Contra Costa county, is the source of supply for large works at Antioch. On the south side of the Antelope valley, at the end of one of many felsite porphyry buttes, clay is taken out. Clay suitable for the manufacture of pottery occurs in large beds on the south bank of the Merced river. Kaolin has been uncovered in three places in Placer county. Fire-clay has been found in the foothills of the southwest slope of the Santa Ana mountains, Orange county. A belt of clays of superior quality extends in a general direction west of north from Elsinore to Corona, in Riverside county.

Concentrate should be dried as thoroughly as convenient before shipment to reduction works. There will be some loss from the sacks by dusting and the dust may be the highest grade stuff; but even 10% moisture means 200 lb. per ton, on which to pay transportation charges and smelter discounts. Where freight is no more than $5 per ton—it is often much more—the cost of shipping this 10% water is 50c. per ton of ore. The loss by dusting, if canvas sacks are used, will probably be less than 0.5 lb. per sack, or say eight pounds per ton. On $100 concentrate this means a loss of 40c. per ton.

The Big Furnaces of the Anaconda Smelter.

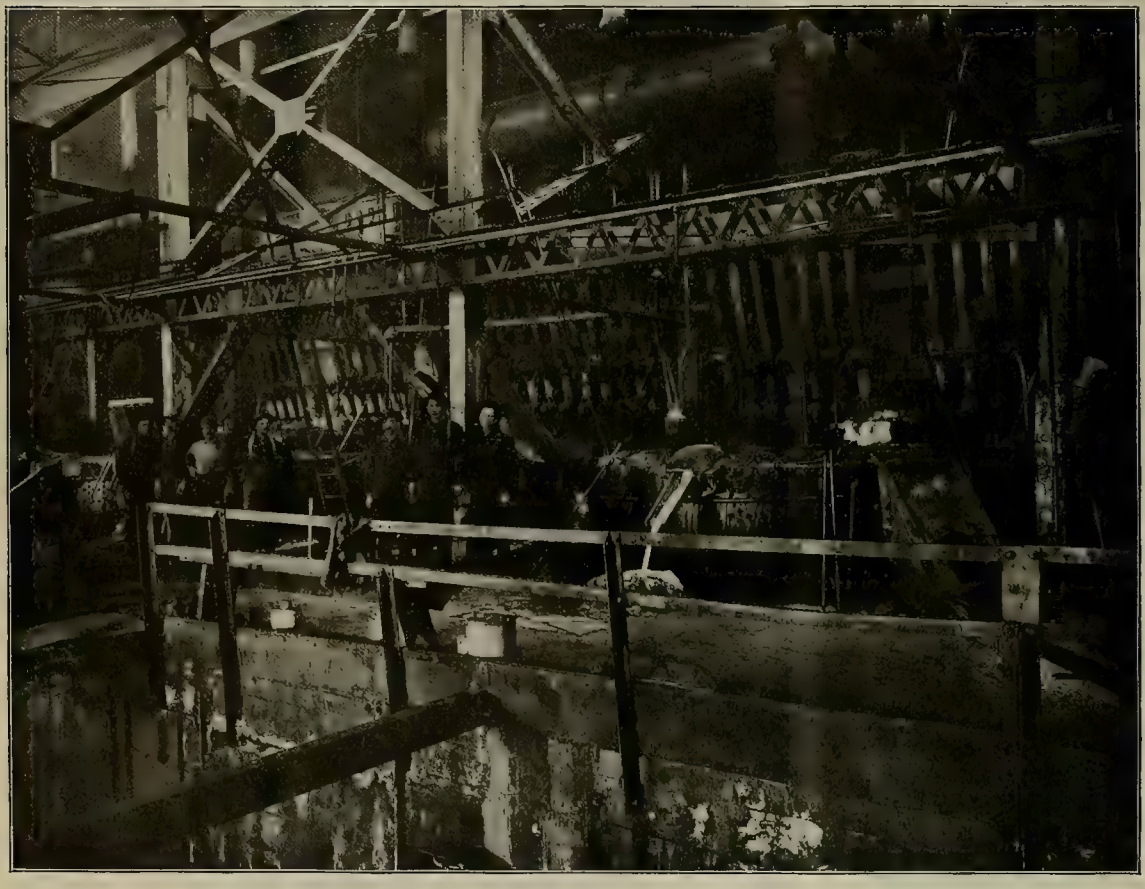
By LEONARD S. AUSTIN.

*Apart from the general organization of the Anaconda Copper Mining Co., the Washoe plant and its accessories at Anaconda, Montana, are under charge of the local manager, Mr. E. P. Mathewson. This is the largest nonferrous metallurgical plant in the world, and illustrates, under the given conditions, the natural development resulting from the necessity of a complex organization.

With many smaller metallurgical plants the organization has generally been arranged so that the business manager gives his whole attention to business details, while the superintendent attends to the technical matters. With the Anaconda Copper Mining Co., however, a technical man was chosen to attend to business details also; the wisdom of this arrangement has often shown itself, since, in this particular case, the mastery of business detail has been as satisfactory as when performed by one who had always confined his attention to business only. Moreover, a comprehensive view of the whole process by a master of technical detail has proved equally gratifying. For example, the 50-ft. reverberatory furnaces of three years ago were successively increased in length to 65, 85 and 102 ft., since it was not known what length of furnace could be used. To make these changes required the expenditure of $120,000 (all of which was recovered out of the economics attained during the course of the experimenting), and success required a complete knowledge of the technical side of the problem, as well as a clear idea of what the finances of the company would permit.

*Abstract from author's proofs of a paper entitled 'The Washoe Plant of the Anaconda Copper Mining Co. in 1905.' *Transactions* of the American Institute of Mining Engineers, July, 1906.

Again, in increasing the length of the blast-furnaces at one time from 15 to 51 ft., it was necessary to know whether it were possible to remove a jacket while the blast was on, and to cut out or to repair one part of the furnace while the rest was in operation. At the time the change was made copper was selling at a profitable figure, and it would not do to shut down in order to make changes. It was therefore necessary to make the change with practically no delay in running. With such considerations, on the financial side, the manager knew he must advance only along lines involving no delay; had he to do with the technical side only, he would have put up with the apparent necessity of shutting down so as to make the improvement.



A Copper Blast-Furnace, 56 Inches by 51 Feet.

In order that the manager could give the closest attention to technical questions, an assistant superintendent was appointed to advise with him and with the heads of departments, and to take his place during his necessary absences.

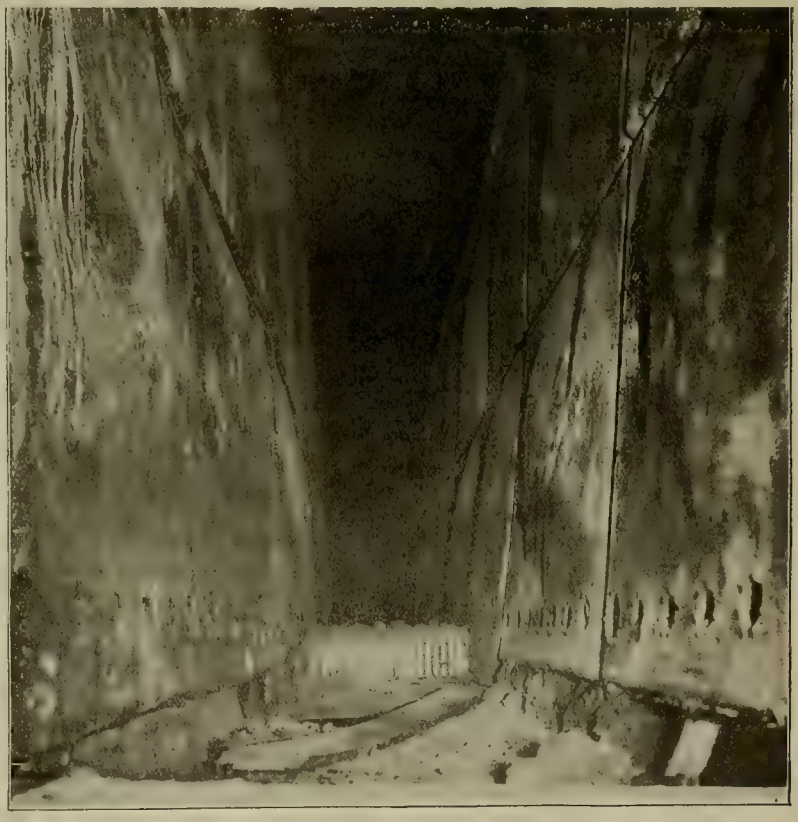
The different departments about the works are under charge of foremen or superintendents, who are specialists in their line of work, and who work in harmony with one another. There are superintendents for the concentrating mill, sampling departments, power-houses, blast-furnaces, converters and the arsenic plant; also chief foremen for the reverberatories, the roasters, the briquetting-plant and the slime-ponds. In addition, there is a general foreman of the works, who has full charge and authority in the absence of the superintendents of the departments. The 8-hr. system, in use at Anaconda, requires that there shall be three shifts daily, so that the general foreman is relieved by two foremen who assume his duties on the



Ore-Bins.

other shifts and who relieve each other on the afternoon and night-shifts every two weeks, while the general foreman always keeps the morning or day-shift. The departments having superintendents, also have foremen, a head foreman, holding the morning shift, and two reliefs alternating on the other two shifts. The chief, or morning foreman, has the larger measure of authority and responsibility. Thus, at no time, is any department left uncontrolled, since the foremen relieve one another, and, as an additional precaution, the general foreman attends not only to the general supervision of the plant but also to those matters belonging to no particular department. Repairs and general construction are under supervision of the mechanical superintendent with an assistant and a head mason. The complex handling of materials is in charge of a master of transportation. For experimental and control work there is an engineer of tests. A chief chemist reports all assays and determinations. The accounting is supervised by a chief clerk, and the purchasing of supplies, both for mine and works, is in charge of a purchasing agent.

The blast-furnace building formerly contained seven furnaces, each 56 by 180-in. area at the tuyeres. These were arranged with their longer axes parallel to the length of the building, for convenience of charging, by means of track charge-cars. A new furnace was made by joining furnaces No. 1 and 2 and including the 21-ft. space between them, which gave a furnace 51 ft. long, and of the original width of 56 in. In a similar manner furnaces No. 3 and 4, and No. 5 and 6 were united; at present there are three large-sized furnaces, each 51 ft. long, and one furnace 180 in., or 15 ft. long. At the slag-door level are seven fore-hearths or settlers, as arranged for the original furnaces, which serve equally well for the enlarged furnaces, there being two fore-hearths for each. A matte-track, at a lower level, serves to bring in the matte-ladles, into which the matte of the fore-hearths is tapped. The large blast-furnaces, 56 by 612 in. tuyere dimensions, have side boshes of 8 in., making the width at the throat 6 ft. There



Interior of Blast Furnace at Hearth-Level.

is no end bosh. There are two tiers of jackets, each 7ft. 5 in. high. In either row, and on either side, the three central jackets are 7 ft. wide each, and the four remaining ones are 7 ft. 6 in. each, making thus the total length of 51 ft. The concrete foundation is surmounted by the two original crucibles, to which was added the connecting bridge, the latter formed of water-cooled plates supported by short jack-screws. The crucibles, or sumps, as they may be aptly called, slope to the tap-hole. The bridge portion has a hearth sloping either way from the centre to the crucibles. Thus the total drainage gravitates to either tap-hole. It may happen that the hearth becomes obstructed so as to throw more of the flow to one of the crucibles and less to the other. Such a result, however, need not interfere with the effective operation of the fore-hearths. Both crucible and hearth are made of silica brick, which has been found to be very enduring with the 40% silica slag here used. Above the upper tier of jackets, comes the heavy mantel-plate, 2 ft. 3 in. high, having a sloping front, and surmounted by the apron or receiving plates, 21 in. high, with a slope of 45 deg., both together making a hopper upon which the charge slides down, tending to keep the finer charge closer to the walls, and the coarser material at the centre of the furnace, all of which tends to promote regular working.

The furnace has a closed top, the fumes being carried off by three down-takes to the large dust-chamber adjoining the blast-furnace building. There are 46 tuyeres at the back, and 42 at the front side of the furnace, or 88 in all, set at 14-in. centres. The space supplementing the lesser number of tuyeres at the front is utilized to make room for the two slag-spouts. It is customary to plug, or leave off, the four tuyeres nearest the ends of the furnace, as this is found somewhat to prevent accretions, so that, practically, only 84 tuyeres are used. The omission of the two tuyeres over the spouts does not appear to interfere with the proper operation of the furnace at this point, all of which indicates irregular working of tuyeres. Where it has been undertaken to cut out every other tuyere, the furnace has not worked so well. This, indeed, may be due to the fact that some of those tuyeres cut out were in good working position, or, rather, that the more frequent tuyeres mean more chances of getting air into the furnace. The tuyeres are punched several times on a shift, and it can hardly be supposed that all the air enters the furnace by the small 1-in. hole thus formed. No doubt a good deal gets in between the jacket and the crust, eventually finding its way by devious passages (those of the least resistance) to the interior of the furnace.

The bustle-pipe extends completely round the furnace, and has two branches from the blast-main, each with its own shut-off gate, so that, to shut down the furnace, two valves must be closed. The tuyere pipes are 6 in. in diameter; the jacket opening being 4 in. in diameter, bolted to the jacket for easy removal in case of necessity. The connection to the blast-pipe is made by a galvanized iron sleeve, with a ring-clamp to make the joint tight. The fore-hearths, or settlers, of the former smaller furnaces serve equally well for the large ones. They are 16 ft. in diameter and 5 ft. high, the matte-tap being 3 ft. below the top of the fore-hearth. The slag enters on the side adjoining the furnace, and flows out on the opposite or front side. Experiments at Great Falls show the best point of outflow to be opposite the point of entrance. The discharging slag flows down a steeply inclined spout, which delivers it opposite a 6-in. flattened water-jet situated just below the floor. This is supplied by jacket and other water. Besides this, there is a flow of water from the encircling cooling-pipe of the fore-hearth, which contributes to the stream which sweeps away the granulated slag through a semi-circular cast-iron lined launder, and conveys it to the dumping-point on the flats below the works.

The exterior of the furnace, having so long a side-wall, is braced and prevented from bulging by ties, carried around the furnace both at the level of the top of the lower jacket, and also under the floor. The horizontal pull of this bracing at the corner posts of the furnace is resisted by inclined ties attached to the floor above at adjoining corner posts. Between the three panels forming the length of the furnace, the jackets are supported by I-beams of the length of the panel (22 ft.). Two sets of the I-beams are to resist outward pressure of the jackets, the upper and heavier sets to hold up the upper jackets when the lower ones have, for any reason, been removed. Two of the outlet or down-take flues, soon to be changed to resemble the central one, are of brick and have hopper-bottoms for the removal of the flue-dust. The third, or central down-take, has an upward and then a downward slope, having a pitch so steep that no flue-dust can rest upon it. Flue-dust, on the upward sloping flue, slides back to the furnace; on the downward sloping side it goes to the dust-chamber.

The dust-chamber, 40 ft. wide and 280 ft. long, is provided with sheet-steel pyramidal hoppers, by which the flue-dust is conveniently drawn off to the charge cars when they are run in below. This chamber, 20 ft. high, affords a liberal space for the settling of the flue-dust. It is connected to the stack by means of a flue of 20 by 15 ft., or 300 sq. ft. area of cross-section.

The furnace is charged through seven doors on each of the long sides, giving access to the entire length. It also has end doors for barring out. The charge is brought in by a train of 18 cars at a time, each car holding 2.5 tons. Eight of these cars constitute a charge amounting to from 18 to 20 tons. The coke is charged separately in two-wheeled buggies, each of 30 cu. ft. capacity, and capable of holding 900 lb. The amount used is 10% of the charge.

The weighing of charges to an 18-car train is thus performed: The cars are spotted to the coarse-concentrate bins, where the specified quantity is weighed in (to two at a time), the flow being controlled by a slide-gate operated by hand. A swinging chute, operated by a compressed-air cylinder, also assists in controlling the discharge. After the concentrates, the 18 cars are simultaneously charged with the briquettes. The train is then taken to the first-class ore-bins for the next item of the charge, then to the slag-bins, and the limestone-bins. It will be seen that, in this way of putting in the materials, the finer portion is at the bottom of the car, and it is so charged into the furnace that it falls to the near side, while the coarser material goes to the centre portion of the furnace.

The temperature of the gases from all the furnaces, in the flue just beyond the dust-chamber, drops as much as 62 deg. C., and the draft-pressure drops 0.2 in. of water when six of the 46 doors are open. The air, with a draft-pressure of 1.7 in. in the flue, has a velocity of 1.5 ft. per sec. through the doors (each of 20 sq. ft. area), and, with six doors open, an admission of 10,800 cu. ft. per min., or one-fifth of the total out-going gases. The quantity entering is proportional directly to the number of doors opened. Of the total heat developed by the burning of the coke and sulphur, 18.6% escapes in the outgoing gases, which, at the entrance to the down-take, have a temperature of 380 deg. C. Not more than these six doors need be opened at any one time, either for charging or for cutting accretions or crusts from the furnace.

THE scientific spirit is of more value than its products and irrationally held truths may be more harmful than reasoned errors.

Drift Mining By Shaft.

Written for the MINING AND SCIENTIFIC PRESS
By D'Arcy Weatherbe.

(Concluded from page 118.)

The system of timbering is simple and appears efficient. Fig. 6 is a cross-section of the timbering in the main working drifts; two uprights or posts from 8 to 12 in. diam. and 5 ft. 8 in. or 5 ft. 9 in. high, are placed 5 ft. apart at top—inside measure. A cap of the same size is placed across the top of these and a plank sprag underneath it, to resist side pressure; sills are rarely used, though often two sets of posts and caps are placed together to take the heavy pressure. Fig. 7, which is a longitudinal section, will explain the method of driving



Fig. 10.

lagging. Across the top of the cap a 'bridging' plank is laid flat, on top of wedges called 'keys'; under this bridging plank the lagging planks, two inches thick, are driven, knocking out the wedges and resting on top of the bridging plank of the set ahead. The method in the breast-drifts is similar, but the posts are placed vertically and are about 4 to 5 ft. apart. The lagging is driven in the same way as described above.

The flow of mine-water is heavy and the plant includes two steam-pumps, a Dow pump, 10 by 7 by 7½ in. and a Worthington, 12 by 7 by 12 in., and a Cornish plunger 10½ in. diam. and 5 ft. stroke. The Cornish pump is in use for about one hour per day and the Worthington runs the rest of the time. The Dow is an auxiliary in case of accident.

On the surface, the equipment consists of a 60-h.p. oil-burning boiler which supplies steam for an engine to run the Cornish pump, the trommel, a single-drum hoist, and a small engine for electric lights (150 lamps capacity). A new Cornish pump of larger capacity is shortly to be installed and a new engine to run it. Wood costs $4 per cord and oil $1 per bbl. delivered. About 25 men are employed at the mine, 18 of whom work underground. This number will be increased when more working faces are provided by extension of the development work. The gold-saving and clean-up plant is automatic, the method being somewhat different from the ordinary.

Fig. 8 and 9 show the arrangement. In the first it will be seen that the ore from the skip is dumped into the hopper, which is at the top of the head-frame—about 90 ft. above the shaft-collar. Into this hopper a jet empties the discharge water from the mine and washes the gravel through the trommel, the oversize passing out onto the

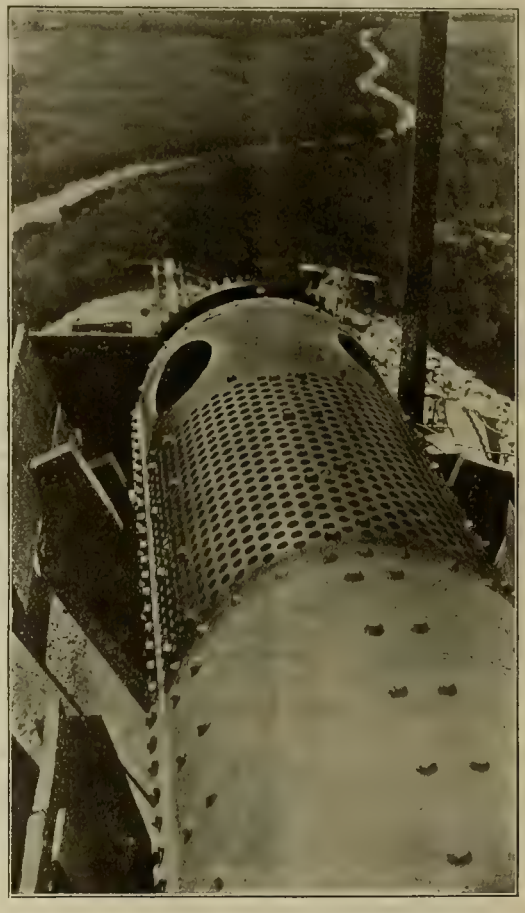


Fig. 11.

dump while the fine is delivered through the perforations to the sluices. The trommel is 14 ft. long and constructed as shown in Fig. 11. It is divided into an unperforated portion 9 ft. long at the top with angle-irons inside to disintegrate the gravel; a section, 3 ft. long with ½ in. holes and an end section of 2 ft. with four oval-shaped holes to let out the larger rocks. The riffled sluice is double (See Fig. 10) and 132 ft. long over all, with a pitch of one inch per foot. Each division is 16 in. wide and 10 in. deep, and carries a small 'mercury surface' riffle at the top; then come 12 ft. of cross-riffle, the remaining length being fitted with angle-iron riffles placed with the bars lengthwise in the sluice. The upper 12 ft. of the sluice are cleaned up every four days and the general clean-up takes place each month. The riffles, commencing at the top, are taken out and washed onto the sluice, the larger stones being picked and washed off. The residual sand, mercury, and amalgam is then taken to the clean-up room.

The clean-up apparatus is shown in Fig. 12; *a* is an iron clean-up barrel, 3½ ft. long by 2 ft. diam.; *b b* are amalgamated copper plates 4 ft. long and 2 ft. wide each; *c* and *d* are mercury traps and *e* is a sluice 11 in. wide 5 in. deep and 11 in. long with cocoa matting on the bottom. The material is put through this process once a month after the general clean-up. The sand and mercury collected from the sluices are placed in the barrel *a* with iron balls, water, and an excess of mercury. This is rotated by means of the pulley wheel a^1 for 14 hours. The pulp is then drawn off at a^2 in a bucket, the slime being allowed to run over the plates first, then the remaining pulp is dumped on the upper plate and the hose turned on.

About 90% of the amalgam is caught in the mercury trap at *c*, the other 10% being collected from the upper plate. Some platinum is secured on the trap *d* and on the cocoa matting below. I was informed by the manager that the tailing contains no appreciable gold. The gold is fairly coarse; occasionally it is found attached to fragments of quartz. The gravel is said to carry about $3 per cu. yd. and the working cost is estimated at about $2 per yard.

Bell Signals and the Hoisting-Engineer.

The best hoisting-engineer is he who is not only familiar with every part of the machine in his charge and its peculiarities, but with the shaft of the mine as well—preferably a miner who has worked in the shaft, and who knows every foot of it from collar to sump. He should know every station; its size, and the arrangements for handling ore and timbers at each; every bell-pull at all the various levels, and how they work; also the loading devices at each pocket beneath the levels. Complete familiarity with these details gives him an understanding of the wants of the men below as indicated by their bell-signals, that no mere mechanical observance of the bell-taps can convey. It should not be required of him that he interpret the significance of fitful jumps of the signal-hammer when it fails to strike the gong, but familiarity with conditions in the shaft hundreds of feet below the surface makes him far better able to understand all signals, whether properly given or not—for there is a vast difference in the manner in which different men ring the signals. One man rings deliberately, spacing his strokes and pauses with mechanical accuracy another gives the bell-cord a succession of quick jerks, the strokes not being properly timed, and the pauses scarcely defined from the intervals between the consecutive strokes.

The foreman is at the 800 and desires to go to the 500-ft. level. The skip is rising rapidly from the 1,000 level. As it approaches the 800 he rings one bell; the skip quickly comes to a standstill. He rings eight bells and the skip, running slowly, stops at the 800. He then rings steadily five strokes on the gong; pauses the interval of a stroke, rings three more strokes, steps aboard the skip and gives one more final pull. The skip rises quietly and at the 500 comes to a stop, and the foreman goes about his business. This is as it should be, and the engineer knows he has hoisted the foreman from the eight to the five—he knows him by his ring. On the next trip down, the skip is rattling along at a lively rate nearing the 500. There is a sudden clang of the gong—another, a pause, then two more strokes, but the engineer has his eye on the tin star that scintillates beneath the gong and he knows that the man who is responsible for this disturbance pulled the bell-cord five times, but he is careless, and the third pull failed to register in the engine-room. He is the tool-nipper and he wants to go below. "Crazy Jerry," mutters the engineer as he shifts the throttle and throws on the brake. Meanwhile the men at the bottom of the shaft are ringing a loaded skip of rock away in the adjoining compartment. To this the engineer pays no attention until he has got Jerry aboard for his journey below the 500. He then throws in the clutch and as Jerry goes merrily downward, whistling the "Good Old Summer Time," the loaded skip ascends in the next compartment. When Jerry reaches his destination, the clutch is thrown out and the loaded skip continues its way upward without a balance.

But it is when the skip must be moved slowly and carefully, as when unloading heavy timbers or long rails at a station, handling shaft timbers, or in the event of an accident, when injured men are to be handled, that the engineer who thoroughly understands himself and his charge is worth his hire. An absent-minded man has no business at the brakes, still such men are occasionally found in this responsible position because they are "sober and steady." The latter are excellent recommendations for any man, but they do not outweigh the defect of absent-mindedness in a hoist-runner. Imagine a hoisting-engineer who forgets within a minute what signal had been given him when he started the skips. Those below ground depend absolutely on the engineer for their safety, and of all the bad traits of hoisting-engineers, that of absent-mindedness is the worst, barring drunkenness. No man should be allowed to touch a hoisting-engine when in any degree drunk. The men working underground should all understand the bell-signals and be instructed in the manner of ringing. The bell-signal system should be as near perfection as possible. Men, whose work is mostly done in the shaft, such as skip-tenders, pump-men, tool and powder-men should all be admonished to exercise care in ringing signals. It is bad practice to yell out warnings of danger from moving skip or cage if the bell-line can be reached—pull the cord. One bell means stop if in motion, either up or down, and is quickly done.

THE FORMATION OF COAL.—The general results of the present inquiry into the transformation of vegetable matter into coal may be summarized as follows:

1. The change from peat to lignite, lignite to bituminous coal, and bituminous coal to anthracite is a process of fractional distillation due to heat.

2. The heat may be applied locally and with great intensity as in a case of volcanic action, or it may be imperceptible but applied throughout a long period of time.

3. In the latter case the action is slow and of such low intensity that it is controlled largely by conditions which accelerate or retard the process.

4. The principal condition controlling distillation of this character is the porosity or impermeability of the rocks which permits or retards the escape of the gases that are formed in the process.

5. Porosity may be due, either to coarseness of grain or to fissures. Where great masses are involved the former has little or no effect as the rocks are practically impervious, therefore, the latter is the great controlling condition of metamorphism. Fissures are produced by joints and by cleavage, and where these are found the coal is in a high degree of carbonization; where they are absent it is changed only slightly from the original peaty condition.—*Mines and Minerals.*

WOLFRAMITE is a tungstate of iron and manganese. Hubnerite is essentially a tungstate of manganese alone. These two minerals resemble each other, the first, however, is usually dark gray, while the latter is brownish red to nearly black. Scheelite is a tungstate of lime, it is very heavy, yellowish white and possesses a dull adamantine lustre. Scheelite is often associated with gold-bearing quartz; this association has been noted in Oregon and New Zealand.

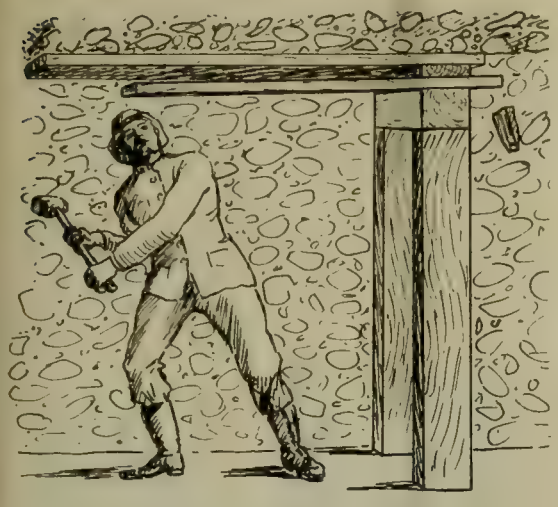


Fig. 7.

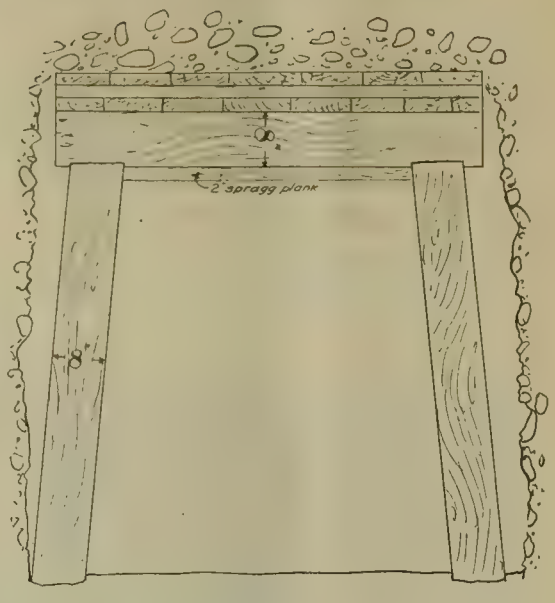


Fig. 6.

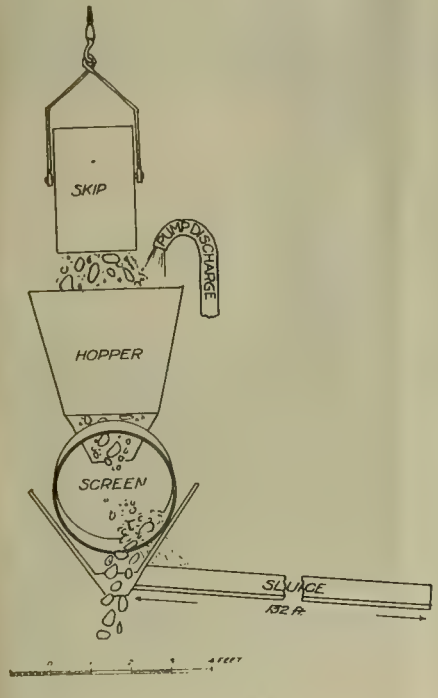


Fig. 8.

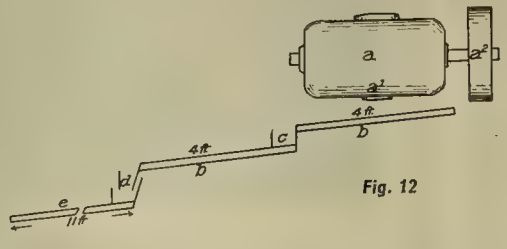


Fig. 12

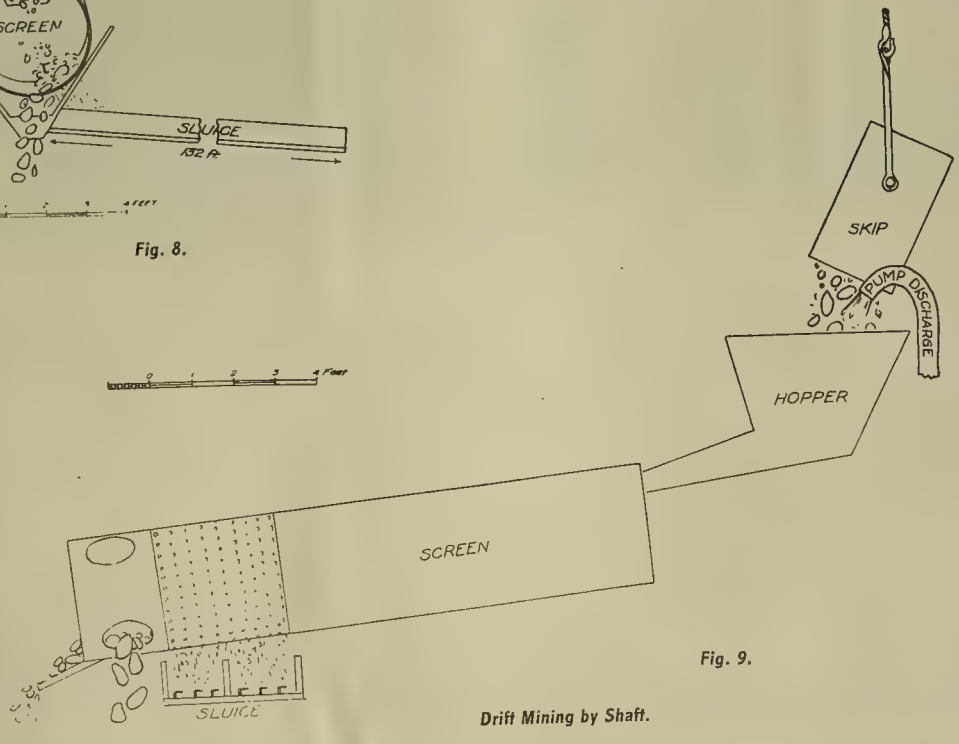


Fig. 9.

Drift Mining by Shaft.

Winning Gold---A Historical Note.

That gold was one of the earliest metals known can scarcely be questioned, for, occurring naturally in the metallic state, its bright color and lustre were well calculated to attract the attention of primitive man and must have led him early to apply it to his needs, both for use and adornment. The first methods for the obtaining of gold, neglecting the infrequent large nuggets which might be picked out by hand, were simply a natural modification of the action of the streams, among the sand and gravel of which the gold occurred. Observing that the gold was exposed in riffles where the lighter sand had been carried forward by the action of the current, it was no difficult task to learn by experiment so to control water currents as to carry away the lighter material occurring with the gold, leaving the heavy metal behind. This was the first, and for a long time the only method; and in its various forms, as panning, the use of cradle, long tom and sluicing, is still of great importance, especially in the development of new districts. In fact, it may be said that in general the history of any mining district is a brief resume of the history of mining as a whole.

The earliest detailed account of gold mining and milling operations is by Pliny (75 A. D.) who describes three methods, the washing of stream sand and gravel, the excavation through shafts of what seems to have been deep gravels, or the soft gossan of a vein, with subsequent washing, and the undermining of large areas which were then caused to cave by cutting away the timbering. Water for these purposes was brought in aqueducts elaborately constructed at great expense, and he also describes the use of sluices cut in the bedrock and covered on the bottom with the branches of some plant, the identity of which is not now known.



Quenching the Ore After Heating, in Order to Make It Brittle. From Agricola, about 1546.

An easy improvement of such operations is to employ some form of cloth to catch and retain the fine particles of gold as they are pushed and carried along the bottom. How soon this improvement was made cannot be known, for the next trustworthy account of such operations is that of Agricola (in 1561), who describes methods that had evidently, at that time, long been known.

The invention of stamp-mills is one of permanent importance in the development of the gold-milling industry, for with the primitive methods of crushing, the treatment of hard ores was difficult and laborious in the extreme. This important improvement had its inception in Saxony about the beginning of the sixteenth century, followed later by its application in the Hartz and in Cornwall. Much difficulty was experienced in crushing the hard ores even with stamps, as first employed, and the custom of igniting the ore and quenching with water to make it more brittle is shown by the accompanying illustration taken from Agricola.

Just what part mercury played in this early metallurgy of gold is not quite clear. Although Pliny speaks of it as an excellent refiner of gold, since the latter alone sinks in it, while the impurities are floated off, yet he does not make any mention of its being used to collect the gold from the concentrate obtained by washing, although stating that the concentrate obtained by a second method was melted down in crucibles. Whether actually employed at that time, it must have been early in use, since the great usefulness of mercury, in collecting gold which is too fine to be readily obtained by washing, is easily perceived.

During the dark ages slow progress was undoubtedly being made in Galicia, Portugal, and the mining districts of central Europe, in the course of which the use of mercury in the treatment of silver minerals must have been developed, for when the rich silver ores of Mexico were discovered, about the middle of the sixteenth century, processes somewhat similar to those which still survive in the *patio* and related processes were quickly put into practice. On the other hand, operations similar to those in use in the New World were tried in Europe without success until a much later period. The exact relation of the New World to the Old in this regard is therefore not completely clear.

When, about 1830, the gold-bearing areas of the southeastern Appalachian region began to be exploited, all the then known processes for the recovery of gold were employed. The highest types of milling processes were the use of stamps for crushing and of blankets to catch the gold, the practices being patterned after those then employed in central Europe. The chemical processes for the recovery of gold, either had their inception or were greatly stimulated in their development at this time. Some years later, when gold was discovered in California, and economic development of Colorado began, the experience gained in the Appalachians, as especially Georgia, served to direct improvements along such lines that progress was phenomenally rapid; indeed, nearly all the older methods were developed to a much higher state of perfection than they had previously enjoyed. In addition, many new ones were devised, as the legions of patent amalgamators and amalgamating processes, now chiefly surviving only in the patent office records, bear witness. Chiefest in importance is the use of hydraulic giants, amalgamated plates, and in later years of dredging processes.

IF limestone is solid, and does not crumble too readily, it may be used in making concrete, but either granite, greenstone, quartz or other hard and less readily soluble rock is better. Before use it should be screened as it comes from the quarry, to rid it of all fine, and the rock, whether limestone or any other kind, should be washed free from dust and dirt before going to the mixing bed or machine. Dirt and organic matter tend to decompose, and consequently disintegrate, concrete. Rock containing sulphide minerals is particularly objectionable, as in time the sulphide will decompose and the sulphuric acid will attack the lime of the cement.

Minas Prietas Reduction Works.

Written for the MINING AND SCIENTIFIC PRESS
By MARK R. LAMB.

In the neighborhood of La Colorada in the State of Sonora, Mexico, are situated two silver-gold mines and reduction works. The Grand Central is leased by Chas. Butters & Co., who have been cyaniding the ore directly as it comes from the stamp-mill, but are now considering concentration. The Creston-Colorado Co. uses the Boss continuous process of pan-amalgamation with subsequent cyanide treatment for the sand and slime. The ores of the two mines are similar except in their tenor of precious metals. The Creston-Colorado mine is in bonanza, while the Butters Co. is taking low-grade ores from old stopes.



Grand Central Mill.

It might be well, in passing, to speak of the conditions which govern the present size and arrangement of the plant and control operations at the Grand Central.

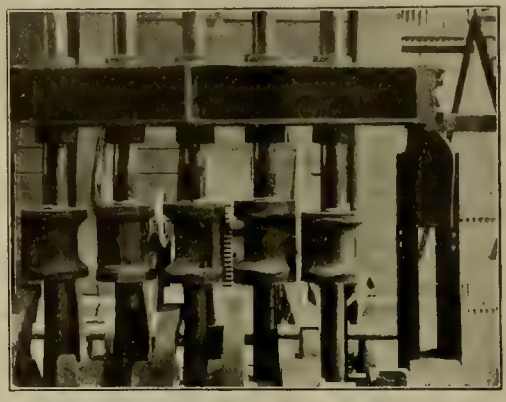
The Butters plant was erected originally to treat a pile of tailing which had accumulated for eight years below a mill of 30 stamps and 10 Huntingtons, with pans and



Detail of Guides.

settlers and Frue vanners. The tailing averaged 60% slime, and the slime and sand-plants were proportioned to work material of these percentages. With change of material due to different treatment in the mill, the plant has a capacity for a greater proportion of slime than is now produced. The present tailing runs about 38% slime. About a year before the accumulated tailing was worked, the mill was closed down by the Grand Central Co. for lack of profitable ore. About the time the stock of tailing was exhausted the Butters Co. completed an arrangement with the owners of the mine and mill and shortly afterward they were producing pulp for the cyanide plant.

The mine is worked by Mexican labor entirely, the drillers receiving an equivalent of $1 gold for six feet of drill-hole. The ground stands fairly well, though some stopes are heavily timbered, and with pine worth four cents per foot, the cost of square set is rather high. The ore is broken into a well-arranged system of chutes, whence it is trammed to the shaft and hoisted to the breakers. An Otto tram transports the broken ore to the mill, a distance of 1,200 ft., for four cents per ton. The 30 stamps are in excellent condition after having run for ten years. The battery-frame is of iron throughout, and is set upon a massive foundation of concrete. Bolts do not loosen, battery-posts do not rot and require replacing, mortar-blocks will never require replacing and to one accustomed to wooden frames it is simply perfection. The stamps weigh about 850 lb.; they make 96 six-inch drops per min., and crush through screens of ⅛-inch aperture. From the batteries the pulp is elevated to the Huntingtons. The pulp from these passes through 60-mesh slot-punched screens on its way to the cyanide plant. The water used in the mortars and re-grinding



Detail of Battery Frame.

mills is cyanide solution carrying 0.02% cyanide, and a few cents gold and silver. Water costs in the neighborhood of 75c. per thousand gallons. The ore upon arriving at the cyanide plant is raised by a wheel-elevator and runs thence to the sand-collecting vats. These have



Detail of Top of Frame.

three side-overflow gates provided with curtains the upper edges of which are kept slightly below the surface of the water when filling. The pulp is introduced and spread evenly over the tank by Butters distributors, the sand settling and the slime running off. This overflow passes through a classifier which separates any accidentally contained sand and returns it to the wheel. The slime goes to a large set of spitzkasten which makes a product about 35% dry slime and discharges clear water which is used for washing and in the mill. This water is returned to the mill tank through 600 ft. of 3-in. pipe, against a pressure of 63 lb. by a centrifugal pump of 18-in. disk, with 4-in. discharge. The quantity of water raised reaches 200,000 gal. per 24 hr. Weak solution and water washes are added to this mill-water before it is pumped.

The sand is given a preliminary treatment in the collecting vats and is then shoveled to lower vats and given a final treatment with strong, weak, and wash solutions.

The aeration received during transference is believed greatly to enhance the extraction, particularly of the silver. The leach from both sand and slime is brought to the precipitation boxes, which are electrical, and have been fully described by Mr. Hamilton in a paper before the Chemical & Metallurgical Society of South Africa. The anodes of these boxes are of sheet-lead, peroxidized, and the cathodes of sheet-tin. The current density, 5 amp. per sq. ft. of anode surface, is such that the metals are deposited in a pulverulent, spongy layer. After a period dependent upon the value of the ore, but generally three times per month, the division of the box through which the leach from the sand passes is cleaned up. This clean-up consists of sliding a pair of brushes over the surface of each cathode, draining the box, gathering the gold and silver slime, drying, and melting. The product from this box is about 60% metal, the balance being lime and silica. This percentage varies, however, within wide limits. The lime comes from the mill, where it is added to neutralize acidity. Electrical precipitation is by no means as perfect as it might be, as a practical substitute for zinc. The anodes of lead are certain to corrode, however carefully they may be peroxidized. The electrodes are spaced 2½ to 3½ in. to avoid short-circuiting, although this occurs occasionally even at these distances. The lead plates, with the present arrangements at this plant during clean-up, require considerable handling, which unavoidably cracks the peroxide coating and shortens the life of the anode. With cone-shaped vat-bottoms, the anodes should last much longer. Experiments are now being carried on at the Virginia City plant of Chas. Butters & Co. with a view to using carbon plates in lieu of lead, with very encouraging results.

The precipitate from the electrolytic boxes is fluxed with silica and borax, and melted in pot-furnaces. It is considered feasible to melt this slime in a reverberatory furnace in a bath of lead, and to cupel the resulting base bullion. Coke for the pot-furnaces is high-priced and, as wood could be used as fuel in the reverberatory, the saving in fuel would be considerable.

Besides this saving there would be a decreased loss in dust, greater ease and speed in melting, and a finer product for final shipment to the States. Formerly the slime was treated by decantation, but a Butters filter-box has been recently installed which permits of a more thorough washing of the slime and a consequent better saving of metals and a less loss of solution.

CHALCHIHUITL, a name celebrated in Mexican archæology, was applied to certain green stones capable of high polish, which were carved into various ornamental forms, and very highly valued. There has been much mystery and much discussion as to what this precious material really was, and whence it was obtained. It seems evident that several minerals were included under this name—among them a green quartz or prase, some of the deeper green varieties of *tecalo* or Mexican onyx (so called), and probably turquoise; but the precious *chalchihuitl* has now been proved to be jadite, a stone which has possessed a singular charm for many aboriginal peoples in widely separated parts of the globe, but which, for some reason, has not so much attracted the notice or the taste of the historic races.

THE Russian Government, realizing the proclivity of laboring men toward drunkenness, makes, for the benefit of the employer, a law requiring a man hired on contract to work continuously for a period of six months or a year, and he is not paid until the end of that period. Without it, it would be impossible to get any continuous work done by the Russian laborer in Siberia.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The black rock from Kendall, Mont., marked E. L. B., is Quartz-mica-diorite.

The mineral specimens from Hardscrabble, Utah, are determined as follows: No. 1, Magnetite, with disseminated chalcopyrite (copper sulphide); No. 2, Pyroxene; No. 3, Magnetite, with a little copper carbonate. No. 1 and 3 are probably from the gossan of a copper-bearing vein, and should be explored by sinking.

The minute crystals from Happy Camp, Cal., are Zircons—silicate of zirconia—thus described by Dana: Crystallization, tetragonal; fracture, conchoidal; brittle; hardness, 7.5; gravity, 4.7; lustre, adamantine; colorless, pale yellowish, grayish, yellowish-green, brownish-yellow, reddish-brown; transparent to opaque. The heavy sand from the sluices should be collected and carefully tested for the presence of other rare minerals, such as thorite—silicate of thorium, monazite, etc. Zircon is valuable for its zirconia content, which is utilized in the manufacture of the Nernst electric lamp.

The rocks from Lyons, Kan., marked J. A., are: No. 1, Diabase. The fine material in No. 2 is evidently a much altered and silicified greenstone containing pyrite. The soft material is clay and talc.

The rocks from Bodfish, Cal., marked C. E. H., are all Grano-diorite in various stages of alteration. No. 1 is silicified and contains much disseminated arsenical-iron sulphide; No. 2 is still more silicious and is impregnated with pyrite; No. 3 is in an intermediate stage of alteration, and contains finely disseminated mispickel; No. 4 is similar and contains both pyrite and mispickel.

'ROLLED GOLD' is a cheap substitute for solid gold, used for jewelry, and consists of brass covered on one side with a thin coating of gold of any of the recognized standards. It is made by brazing a thin plate of gold on to a thick plate of brass, and then rolling the ingot out into thin sheet from which the articles are manufactured. The gold covering may be of any quality or thickness. Gold of 9 to 10 carat is the usual quality, but better qualities are also extensively used. In the best qualities the gold is sufficiently thick to bear engraving without cutting through into the base metal. Rolled gold is mostly of German origin, but it is also manufactured to a considerable extent in Birmingham, England. Before being placed on the market, articles of the poorest quality of rolled gold are 'dipped' in order to improve their appearance, but the thin coating of gold thus obtained soon wears off. When the brass is covered with gold on both sides it is known as 'filled gold,' Watch-cases of filled gold are made in America, and at Birmingham, England. The advantages of 'rolled' and 'filled' gold over electro-gilded articles is that the coating of gold on the former is much harder and thicker.

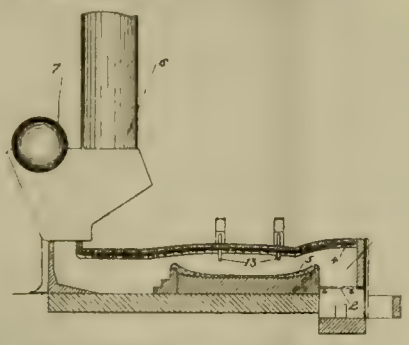
THE vanadium minerals—descloizite and vanadinite, both of which are vanadates of lead—are used as oxidizing agents in dyeing. Descloizite from the Globe district, Arizona, is exported to Germany for this purpose. Chromite, at present mainly employed, is being replaced by the vanadium salts because the latter can be regenerated, while the former is consumed.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

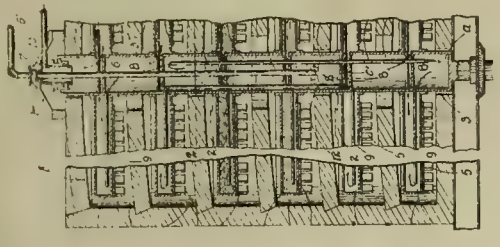
METALLURGICAL APPARATUS.—No. 823,561; E. A. Touceda, Albany, New York.

In a metallurgical apparatus, the combination with a fuel-burning metallurgical furnace; of an electric heater located within said furnace; an electrical generator connected with said electric heater, and a generator-operating motor operated by heat emanating from said furnace.



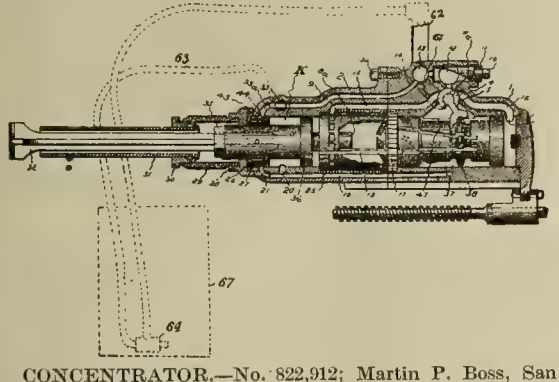
ROASTING-FURNACE.—No. 824,181; Frank Klepetko, New York.

In a rabble apparatus, a hollow shaft and hollow arms therefor, means for circulating a body of water through a section of the shaft and corresponding portion of the arms, means for circulating steam generated therefrom through another section of the shaft and portion of the arms, and inlet means and outlet means for the circulating mediums.



ROCK-DRILLING MACHINE.—No. 823,980; Cassius M. Walker, Pueblo, Colo.

The combination of the casing, piston-hammer, piston-chuck, means for supplying fluid under pressure to reciprocate the hammer, an exhaust, means for throttling the exhaust, a cleaning-tube, a valve-controlled channel and ports whereby the exhaust may be conducted to said tube, and a valve-controlled channel and ports whereby the live pressure may be conducted to the cleaning-tube.

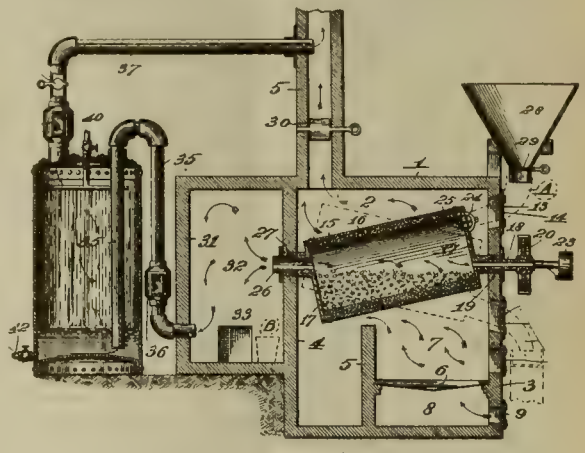


CONCENTRATOR.—No. 822,912; Martin P. Boss, San Francisco, California.

In an endless-belt concentrator, adjustable controlling-rollers relatively disposed to the belt to counteract by their change of inclination, the lateral crawl of the belt, in combination with mechanism actuated by the traveling belt, itself, in crawling, to effect the adjustment of said controlling-rollers, consisting of a pair of relatively oppositely arranged revoluble cam-contacts upon the receding faces of which the sides of the belt impinge to momentarily turn them, one of said cam-contacts being on each side of the belt, connections for operating said cam-contacts in unison, and suitable connections from said contacts to the controlling-rollers.

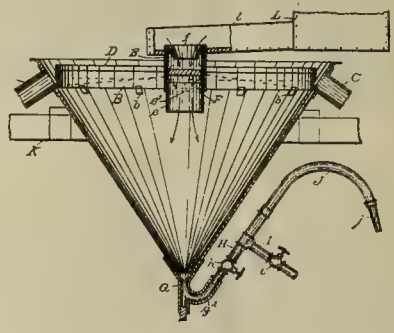
ORE ROASTING-FURNACE.—No. 824,263; Charles H. Rider, St. Louis, Mo.

In an ore-roasting furnace of the class described, a roasting-chamber provided with inlet and outlet doors in one wall, an obliquely-disposed cylindrical retort arranged for rotation in the chamber, heads fixed in said retort in one of which heads is formed an opening so located as to coincide with the openings in the wall of the chamber, and a plate normally closing said opening.



SETTLING TANK.—No. 824,279; John M. Callow, Salt Lake City, Utah.

In a settling device, a funnel-form tank, a ring placed interiorly of said tank and forming with the wall of the tank a channel therein, said channel provided with outlets and a bottom inclining toward said outlets, a band of flexible material supported upon said ring and means for tightening or loosening said band whereby said band may be variably adjusted at different portions of the circumference of the ring to secure a perfectly level overflow.



ORE SEPARATOR OR FILTER.—No. 824,905; Claus P. Christensen, Bullfrog, Nevada.

An apparatus of the class described comprising a main supporting frame, a pair of belt pulleys mounted in bearings at each end of said frame, means for adjusting one of said pulleys, an endless separating belt passing around said pulleys, said belt having raised portions at each side thereof, a supplemental supporting frame mounted on the main supporting frame between the belt and the belt pulleys, a water-receiving trough mounted on said supplemental frame below the belt, belt-supporting rollers over said water trough, means for depositing the materials to be separated on said belt over said water trough, a receptacle at one end of the main frame for receiving the solid matter from the belt, a guide roller on the main frame over which said belt takes, a tamping device supported by the main frame for tamping said belt to remove the solids therefrom, drive mechanism for said belt, means connecting said belt-drive mechanism with said tamping mechanism to operate the same.

A Modern Tramway at an Old Mine.

Western men do not associate New York State with mining operations, save such as are involved in city subways and tunnels, but it appears that the re-opening of the Old Forest of Dean iron mine, in Orange county, involves many interesting problems. Among others is the tramway. Owing in part to the surface of the country being broken into hills and ravines, and partly to difficulties in connection with obtaining right of way, the railroad could not be carried to the Hudson river. The last 6,300 ft. of the haul to the dock is accomplished by means of an aerial tramway. At the termination of the surface-road, the cars dump into a bin of 500-ton capacity. From this the ore is discharged into a hopper, which delivers it into the buckets as they pass round the loading terminal of the cableway. The wire-rope conveyor was built by A. Leschen & Sons Rope Company, St. Louis, and is of the double-rope type. The cable is carried on 23 towers, and in the distance of 6,300 ft. the ore travels down grade about 390 ft. The capacity of the tramway is 23 tons per hour. The essential feature of the Leschen automatic system is that the buckets are permanently attached to the traction ropes and are loaded by a traveling automatic loader or hopper. This hopper after having been filled from the chute travels alongside the bucket as the latter passes over the rail at the terminal station. After having emptied its contents into the bucket the hopper is returned to the original point under the chute by the movement of a lever. The buckets are so hung in the pendants as to upset easily when tipped, though when in transit they are securely locked by means of a catch to prevent them discharging their contents. At the unloading stations the buckets are discharged by being automatically tripped, and by means of a righting device are returned to their normal position ready for loading. A single operator is required, and he is placed at the bin where the ore is dropped into the automatic loader. At the dock on the Hudson river, a bin of 1,000-ton capacity is being erected. From this the ore can be discharged into railroad cars on a siding of the West Shore railroad, or it may be loaded into boats after being dropped through a chute into a car traveling back and forth on an incline and connected by cable to a drum driven by a small engine. The 1,000-ton bin, according to the original plan, was to be placed at the water's edge, discharging on one side into cars and on the other side into barges. Owing to the fact that the rock underlying the surface clay pitched at a sharp angle toward the river a suitable foundation could not be secured, and the bin was therefore built about 100 ft. back from the water.

Publications Received.

'MECHANICAL DRAFT' by J. H. Kinealy. This little volume treats of the various systems of mechanical draft, forced draft and induced draft, draft under differing conditions; the effect of economizers, draft fans, etc. A book both interesting and valuable to those in charge of steam-power plants. Sent by MINING AND SCIENTIFIC PRESS upon receipt of price, cloth bound $2. Spon & Chamberlain, publishers, 123 Liberty St., New York City

Trade Treatises.

ABBE ENGINEERING CO., of 220 Broadway, New York, has issued a profusely illustrated catalogue, entitled 'Pulverizers.' It describes the numerous types of pulverizing devices made by the company, including laboratory mills, jar mills, pebble mills, tube-mills, ball mills, crushers and crushing rolls, and others, for both wet and dry grinding, coarse or fine.

HENRY TROEMNER, of Philadelphia, has issued Catalogue B. A. L., describing the Troemner balances—assay, analytical and pulp. The pamphlet is well illustrated, showing the many styles of balances manufactured by this maker, together with the other paraphernalia used in precise weighing in the laboratory and assay office.

THE BUFFALO-FORGE CO., of Buffalo, N. Y., has issued Catalogue No. 97, descriptive of its new air-washer and humidifier, a most useful sanitary device for purifying the air of apartments. The construction and method of operating the air-washer is well illustrated and described by numerous half-tones and line drawings.

Commercial Paragraphs.

WARREN C. BOGUE, Denver manager for THE MINE AND SMELTER SUPPLY CO., is expected to return from Alma, Michigan, where he has been the past three months on account of illness.

CHISHOLM, MATTHEW & CO., of Colorado Springs, has secured the order for Edwards roasters in the cyanide mill now being erected by the Golden Cycle Co., for the treatment of Cripple Creek ores.

THE WELLMAN-SEAVER-MORGAN CO., of Cleveland, O., has received an order for 15 six-foot Chilean mills for the Utah Copper Co., at Garfield, Utah, one of the largest orders ever placed for Chilean mills.

The Pelton-Francis turbine, recently placed on the market by the PELTON WATER-WHEEL CO., has contributed its share to this season's work and is proving a valuable adjunct to the company's business. This is a new departure in water-wheel practice, and is attracting the attention of engineers.

THE COLORADO IRON WORKS CO., of Denver, has lately entered orders for two impact screens for Leadville; one for Kelvin, Arizona; two for Boulder, Colorado; three for Providence, R. I.; two Dorr classifiers for Mexico; a set of Humphrey 27 by 14-in. rolls for Murray, Idaho; and a set of the same type of rolls for Mullan, Idaho; and one 11 by 15-in. Dodge crusher for New Mexico.

THE UTAH MINING MACHINERY & SUPPLY CO. reports having secured an order from the Boston Consolidated Mining Co. for 234 Standard 8-ft. Callow settling and pulp thickening tanks, and 78 dewatering tanks to be used in the concentrating plant that it is now erecting at Garfield, Utah, the order calling for delivery by March 1, 1907. This is the largest order for settling tanks, of special design, ever placed by one company.

THE RISDON IRON WORKS, of San Francisco, reports receiving the largest concentrator order ever placed in the history of the mining industry. Last year the Utah Copper Co. gave an order for 80 machines of the Johnston type, with certain improvements and modifications which have recently been applied to them. Before the 80 machines were delivered it received a further order for 1,104 machines. It also has an order for 234 machines from the Boston Consolidated Mining Co. of Utah.

L. VOGELSTEIN & CO., New York, reports that the German consumption of foreign copper for the months January to May, 1906, compared with the same period in 1904 and 1905, was:

	1906. Tons.	1905. Tons.	1904. Tons.
Imports	51,962	42,744	47,231
Exports	5,059	5,324	3,239
Consumption	46,903	37,420	43,992

THE success with which wind-mills have been used for pumping and drainage purposes in Holland, and in many places on the prairies of the Western States, leads one to believe that they could be used for the same purpose in mining. They are but little used in connection with mines; that is, perhaps, due to their unreliability, and to the fact that most mines are situated in mountainous districts, where, owing to the excessive force of sudden gusts of wind, wind-mills would be liable to serious accident, if not to total destruction. Thus, with a pleasant breeze of 10 miles per hour we have a pressure of 0.5 lb. per sq. ft. but with a hurricane of 100 miles per hour the pressure has gone up to 100 times the first pressure or to 50 lb. per sq. ft. That is, the pressure increases as the square of the velocity.

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Editorial.

THE AMERICAN MINING CONGRESS will hold its annual session at Denver on October 16 to 19, inclusive. Among the matters to be discussed will be the report of the Committee on Mine Drainage Districts and the prevention of mining frauds. Another subject to be ventilated is that of damage due to smelter fumes. The Secretary, Mr. James F. Callbreath, Jr., will be glad to receive suggestions such as may contribute to the usefulness of the convention.

IN OUR LAST issue we outlined the probable control of undeveloped coal lands by the Government and the impracticability of the alternative project, of coal mining by Government, in order to influence trade conditions. It appears that this forecast was correct, for during the last few days the Secretary of the Interior has issued an order withdrawing from entry six million acres of public lands which are known to possess workable coal. This will enable the Government to study the coal situation in relation to the monopoly of a great natural product. It is likely that the step will provoke opposition and that its legality will be contested. We hope it may be upheld.

INVESTIGATION OF RESULTS on the Rand indicates that the Chinaman costs from 12 to 15 cents per shift more than the Kaffir. Our contemporary, *South African Mines*, states this to be the experience at a representative group of mines. It is questioned whether the coolie is worth the extra cost, which is due largely to the complex arrangements involved in bringing him to South Africa. He earns less, it is true, in wages, but he costs more to feed, police, and administer. It may not entail more expense to bring him to the mines than the Kaffir, but the yellow man has to be re-patriated while the black fellow shifts for himself. It appears, therefore, that the Chinese experiment is a disappointment, but this is not the same thing as saying that it is a failure, because whether cheaper or dearer than the Kaffir, it is a fact that there are not enough Kaffirs. What the Rand wants is sufficient native labor. Experience in other countries emphasizes the conclusion that importation of laborers is a mistake, so long as the people of the country can be taught to work and secured in sufficient numbers.

IN THE LAST Bi-monthly Bulletin of the American Institute of Mining Engineers, the Secretary refers to certain notes placed at his disposal by a member, who had not the time to put them into shape. In this case the result of Dr. Raymond's work on Mr. W. H. Shockley's material, is, of course, an interesting article. Incidentally the Secretary states his argument that "such recent and trustworthy data concerning a new and important mining industry ought not to be withheld from our *Transactions*, simply because they are not sufficient to

constitute a complete academic treatise on the subject. This argument is recommended to the attention of many other members, who are waiting for the opportunity to contribute something 'monumental' to our *Transactions*. In a number of instances, death has nullified this ambition, and the intended 'monumental' contribution has turned out to be an obituary notice by the Secretary, instead of a valuable record of the professional experience thus hopelessly lost to the world." Which is manifestly true. But the quality of the Secretary's obituaries is so good and the sentiments he puts into them are so excellent that we almost think his memorial literature is more inspiring than the technological monument the other fellow intended to build; the Doctor's obituary is more likely to live than Smith's or Brown's autobiography. Moreover, we would be sorry if many engineers followed Mr. Shockley's example, for it is a hard task to digest another man's notes and it is rarely well done save by the perpetrator himself. Dr. Raymond is a man to whose capacity for work there seems no limit intellectually, and therefore we do not want to see an unnecessary trespass on his physical strength. Hence this friendly protest.

A Fiasco and Its Lessons.

The misfortune of the Fresno Copper Co., Ltd., would not call for comment save for the lessons which it conveys. We have delayed reference to the matter until adequate information was obtainable. The story is a simple one. In 1901 Mr. H. B. Vercoe bought a ranch in Fresno county for about $12,000. On this ranch there was a shaft 120 feet deep. It was an abandoned copper mine. The ranch and the mine on it became the basis of the California Copper Syndicate, organized at London with a capital of £30,000. In April, 1902, 80 acres were transferred to the Fresno Copper Company for £105,000 in fully paid shares. Some work was done at the mine, and a smelter was projected, so that in July, 1903, the Fresno Company took over the remaining holdings of the Syndicate, namely, 2,360 acres of land and a gold-quartz mine which was to supply silica for the smelter; for these the vendor syndicate received £195,000 more in shares. The Fresno Copper Company had an authorized capital of £400,000; this stock sold recently for over £2 per share, so that the vendors had a chance to clear a large sum of money. Two months ago an independent engineer made a careful examination; on July 13, the secretary of the Company posted a notice on the board of the Stock Exchange at Glasgow, reading: "We are instructed to inform you that Mr. Fred J. Siebert, the expert appointed to examine the mine, has condemned it." The shares fell to two shillings.

When the mine was first taken over there was only one shaft that had penetrated below the oxidized material, into sulphide ore. Down to 90 feet, the workings were in the zone of decomposition. Mr. Vercoe's samples showed an average of about 6 per cent copper. Several other engineers reported on the mine, favorably. Among them was Mr. Herbert Lang, who was retained, as a specialist in copper smelting, to advise on the ore reduction. He accepted Mr. Vercoe's sampling and, on this insecure basis, he also spoke highly of the showing in the mine. Subsequently, he advised, repeatedly, that the mine be sampled systematically, not only to check the statements made, but to give data required in mixing charges for the smelter, which was built at a cost of £50,000. In April last, Mr. Lang sampled the principal ore-dumps, obtaining an average of 1.7 per cent copper; his report was received at Glasgow on May 26; nevertheless, on June 1, at a shareholders' meeting, a glowing account was rendered by the secretary of the Company, who had just visited the mine, and Mr. Siebert was quoted, correctly, as having formed a good impression of it—this impression to be checked by the sampling he was about to undertake. That sampling eventually gave 1.04 per cent copper and 13 cents per ton in precious metals. It remains but to add that Mr. Vercoe is a mining engineer in good standing, for he is a member of the Institution of Mining & Metallurgy. Where then is the nigger in this disordered wood-pile?

Mr. Vercoe bought the mine as a speculator, he reported on it as a promoter, he became managing director while a vendor. During the five years following the inception of the enterprise, no expert opinion was obtained save that of the vendor and his agents. The engineers were all engaged by Mr. Vercoe; the first proper sampling of the workings pricked the bubble and scattered the iridescent films all over the floor of the Glasgow stock exchange. It is true, the pleasant expectations of the directors were fortified by the opinions of all sorts of visitors, such as the secretary, several of the directors, some of their relatives, more of their friends and even of neighboring mine superintendents; but the estimates of each and all of these people were worthless, because they did not include proper sampling. A copper mine in the oxidized zone is a pretty thing, gay with color and gorgeous to the beholder; but chromatic splendor is not indicative of richness. The directors who came to California and returned to Scotland with a few pretty specimens of copper ore, to have them assayed by some celebrated chemist, were taking part, not in business, but in *opera bouffe*. Systematic sampling honestly done at any time between April, 1901, and April, 1906, would have laid bare the true inwardness of the mine.

Two lessons are to be learned. In the first place, a metallurgical specialist should not report on a mine and, when he does, he should take his own samples. Next, a report is worth about what you pay for it. Investors and directors who accept vendor's reports, get advice that is worth just what they pay for it—nothing. The mine was bought for a few thousand dollars and then capitalized for more than a million, on the advice and management, throughout, of the vendor, the vendor's experts and the vendor syndicate. A fair speculation at $12,000, it became a ghastly certainty at $1,500,000. This is an old method, revived. Twenty years ago it was the usual thing to buy mines in America for dollars and to float them for pounds, to take the vendor's statements and to put the vendor's engineer in charge. The Fresno Copper fiasco is an anachronism; such methods are out of date; there is no excuse for them.

By the Way.

It has been said that one man's rights end only where another man's begin. This is the only possible interpretation of equality of rights, of mutuality. This is the spirit in which we should enter upon our contracts. Is this the spirit of the age? The spirit of the age is to obtain some personal advantage, all because of the old idea which is universally rejected and yet persistently applied in action that one man cannot obtain an advantage without injury to some other man. This may be true in war and love, the one a remnant of barbaric days, the other a law unto itself, but it is not true in commerce, and we all know it and all disregard this knowledge. Where commerce is carried on as a warfare and all rules of honesty and morality are ignored, it may cause the over-prosperity of one man through the enslavement of others, but I refer to that class of honest, progressive commerce in which alone all of us are interested.

Every man attaches a great deal of importance to his signature when he endorses it on a check payable to his order, especially if the amount be large. This feeling of importance is intensified when he attaches it to a promissory note or to a sworn statement. The factor which intensifies this feeling of importance we usually call "the sense of honor," and we can take it for granted that the validity and necessity of the sense of honor in such cases is beyond discussion. A contract to sell or to buy goods, is an express executory document, and the principles involved are of the highest order; an easy way for you to realize this is to read carefully the wording of any of your own contracts when it is being broken at your expense. A man's honor is as fully at stake when he attaches his signature to a contract as when he attaches it to a promissory note. If he repudiates or openly or secretly breaks the contract he dishonors his signature. The financial measure of his action, if he be the buyer, is the manufacturer's profit; if he be the seller, it is the difference between the contract and the market prices. A definite sum of money is at stake, and the breach of contract is, therefore, no more nor less than an appropriation of another man's money.

Some men may smile at the legal form which some manufacturers adopt for their contracts. This is not a wholesome attitude. Let your contracts be as simple and as short as possible, but give them a legal appearance, and do not omit the legal phraseology, for that is just what will help you and the person with whom you make the contract to remember that the signature is not a mere dash of the pen, but serious undertaking, in which the integrity of a name and of a reputation are at stake.

A breach of contract is bound to be a most potent demoralizer and a shield for all kinds of malpractices; malpractices which in many quarters are accepted as regular routine business; fixed habits which drug our sense of right during the six days of the week and create a personality, though outwardly active, which selects the easy, but devious method, in preference to that which requires concentration, patience, and Sunday morals on week days. As Franklin once said: "Tricks and treachery are the practice of fools that have not wit enough to be honest."—Alfred Sang in *Industrial World.*

During President Roosevelt's incumbency in office 802,000,000 pieces of metal money have been coined in the United States Mint in Philadelphia, according to figures given out recently by Superintendent Landis, who for several weeks past has been hard at work compiling data relative to the output from the Philadelphia Mint as compared with the output from other Government money mills. Superintendent Landis in his report, which includes the work of the Philadelphia Mint, says that the output of metal money throughout the country is going on without interruption or delay, despite the fact that the money now in circulation reaches $32 per capita and that the per capita of small change, notably quarters, dimes, nickels, and cents, is increasing steadily. The following statement shows the coinage, by pieces, of metal money manufactured under the several administrations during the past 20 years in Philadelphia: Cleveland's administration, 1885 to 1889, 254,065,293 pieces; Harrison's administration, 1889 to 1893, 358,660,725 pieces; Cleveland's administration, 1893 to 1897, 238,011,174 pieces; McKinley's administration, 1897 to 1901, 540,497,141 pieces; Roosevelt's administration, 1901 to 1906, 802,000,000 pieces. Of the $82,000,000 in silver quarters coined in the mints of the United States since the establishment of the first mint, the mint at Philadelphia coined $9,500,000 under the present administration. Of the $50,000,000 in dimes coined in the United States since 1792 the mint there coined $8,000,000 under the present administration; of the $27,000,000 in nickels or five-cent pieces coined, the local mint made nearly $7,000,000 under the present administration; of the $18,300,000 in cents coined, the mint at Philadelphia turned out nearly $4,000,000 during the present administration. In other words, there has been coined at the United States Mint there since President Roosevelt assumed the presidency nearly one-fourth of all the cents coined since the establishment of the United States Mint in 1792; over one-fourth of all the five-cent nickels, nearly one-sixth of all the dimes and over one-ninth of all the quarters.—*Industrial World.*

The evidences of Mexico's prosperity, under the gold standard, are manifold as shown by statistics in a recent article in *Appleton's Magazine.* There was an increase of three million dollars in the Federal revenues during the first year; the capital of the chartered banks was augmented 20 millions, or 30%, and the reserves of these institutions in the same ratio, thus adding 30 millions to the banking capital of the country and, moreover, the business of these concerns was doubled in that year; there was a gain of 15% in the tonnage of vessels in commission in Mexican waters; manufacturing has been largely expanded, chiefly owing to the utilization of electrical energy obtained from water power; agricultural industries have been promoted, through irrigation, and evidences of Mexico's prosperity are apparent in every part of the republic in the form of costly public improvements. About 150 millions of foreign capital was invested in productive enterprises during the last year; most of the American money was placed in railroads and mines and it is estimated that our holdings in the latter were increased 25 millions, while investments in all enterprises are now 600 millions with the prospect of their reaching a total of one billion in the near future. French capital has also been poured into Mexico and it is noteworthy that in less than one month after the inauguration of the gold standard Paris bankers had secured control of the banking interests of the country through investment in the leading institutions of the city of Mexico. Canadian capital, as well as German, Belgian, Swiss and Italian, is being invested, while very little British money is in evidence. Great Britain is losing ground in Mexico. Apparently she has decided to leave the Mexican field to us and devote her attention to South America. British trade with Mexico has fallen off one-half in the past ten years. Until a quarter of a century ago the British commercial interest in Mexico predominated over other foreign capital in the republic. It now ranks fifth, and is steadily dwindling. Still, over $100,000,000 in Mexican Government gold bonds are locked up in British safes and are considered as excellent securities.

Special Correspondence.

BUTTE, August 4.

During July there was a reduction in the tonnage of ore mined in the Butte district, but an increase in the pounds of copper produced. There was a general increase in the percentage of copper, especially in the output of the Anaconda, Parrot, Trenton and Red Metal mines. The total copper production for the month was 33,922,370 lb., against 32,576,700 lb. for June, an increase of 1,345,670 lb. The tonnage in July was 436,480, against 437,550 in June. The July production by companies was a follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	117,800	8,952,800
Anaconda	127,100	9,151,200
Butte & Boston	19,220	1,345,400
Washoe	17,360	1,249,920
Parrot	10,850	672,700
Trenton	17,050	1,193,500
North Butte	31,000	4,185,000
Red Metal	40,300	2,861,300
Original	29,450	2,179,300
East Butte (lessees)	6,200	620,000
Pittsburgh & Montana	4,650	348,750
Miscellaneous	15,500	1,162,500
Total	436,480	33,922,370

Between 16,000,000 and 17,000,000 lb. copper were turned out by the Washoe smelter at Anaconda, and it is stated that with the improvements now being made, the capacity and output will be 20,000,000 lb. per month. The output of the Boston & Montana smelter at Great Falls was about 10,000,000 lb. in July, and that plant is also being enlarged so that it will be able to handle an additional 500 to 800 tons of ore daily.

The East Butte Mining Co. has begun the use of its new engine and air compressor. Sinking, under contract, has been resumed on the main shaft. —— The Lewisohn General Development Co. has abandoned work on the Altoona, one of a group of mines and undeveloped claims upon which it has a lease and bond. The old workings are between 300 and 400 ft. deep. The Lewisohns pumped out the water and examined the old workings, but concluded that the showing did not justify further exploration. The company is now sinking a shaft on the Montgomery, adjoining the Bullwhacker, owned by Patrick Clark, of Spokane. The Bullwhacker vein will doubtless also be found in the Montgomery. This vein runs north-south, whereas all other veins in that vicinity, including those of the Pittsburgh & Montana Co., strike east-west and have been traced up to the lines of the Bullwhacker.

Another discovery has been made on one of the claims of the Butte Hill Copper Mining Co., which is exploring ground a mile farther north than any other copper mine. At a depth of 200 ft. a cross-cut has been run 100 ft. through vein-matter, and an 18-in. streak has been cut that assays 3% copper and 20 oz. silver per ton. The find is chiefly valuable in settling the question whether there is copper in that part of the district.

The Butte Coalition Co. is sinking both the Rarus and Corra shafts, and with the Butte & Boston is sinking a new shaft on the Tramway claim, owned jointly by the two companies. It is mining ore in the Minnie Healey, Rarus and Corra, and the Nipper vein is being mined for it by the Parrot Co., the Tramway by the Boston & Montana, and the Belmont by the Anaconda Co. The company is hoisting about 1,300 tons per day, but as soon as improvements now under way are completed, the output will be increased to about 1,800 tons. ——The Eagle Mining Co. has begun shipping ore, mined at a depth of 200 ft. The shipments have been yielding from 75 to 100 oz. silver per ton. The vein is five feet wide. —— F. Augustus Heinze, who has secured control of a large porphyry dike in the Rimini district, about 18 miles southwest of Helena, will test it by diamond-drills. On the surface the dike carries $3 in gold per ton, which, it is thought, can be worked at a profit. —— The Butte Copper Exploration Co., which is developing the Six O'Clock group on the east side of the district, has reached a depth of 800 ft., where a station is being cut. This will delay sinking for several weeks, but when the station is completed sinking will be resumed to 1,000 ft., which point is expected to be reached by the middle of October, and then a cross-cut will be run north to the vein.

The shaft of the High Ore mine of the Anaconda Co. has reached a depth of 2,400 ft., where a station is being cut. The shaft will be sunk several hundred feet deeper and will be connected with the workings of all the mines on Anaconda hill for the purpose of draining them through the High Ore.——Re-timbering of the Mountain View mine, of the Boston & Montana Co., has been finished and the mine is yielding the usual quantities of ore. —— Lessees are working in ten shafts of the East Butte Co. and shipping 150 to 200 tons of ore daily, the gross returns being $2,000 per day, of which the company receives 25%. The ore is treated at the Washoe and Clark smelters.

The precipitating plant, built by lessees to work the tailing of the old Parrot smelter, covering about seven acres in East Butte to a depth of 5 to 30 ft., has been started. It was built at a cost of $25,000. Upon the expiration of the lease the plant will revert to the company, which will get a royalty of 25%. It is announced that when the improvements at the Washoe smelter, now under way, are completed, that plant will be able to turn out 20,000,000 lb. of copper per month. Among the additions being made is a blast-furnace 87 ft. long, eight roasters, two stands of converters, and corresponding increase in all auxiliary facilities.

It is reported that F. Augustus Heinze is negotiating for the Rex group of mines in the Cœur d'Alene country. He already has secured control of the Stewart mines.

SALT LAKE, August 4.

The ore and bullion settlements last week aggregated $596,500. In the Salt Lake Stock & Mining Exchange for the same period there were transfers of 183,478 shares for $160,060.——A post-office has been ordered established at Goldsprings, a new mining camp in the western part of Iron county, which has a population of about 50 persons. The Jenny Gold Mining Co., operating there, has developed a large body of milling ore and a mill has been ordered. Charles A. Short, of Goldsprings, is manager.

In Beaver county, the Horn Silver Mining Co., at Frisco, has encountered a new ore-shoot on the 700-ft. level, some distance north of the old workings. It is believed to be an extension of the original Horn Silver vein. The ore is of shipping grade, carrying gold, silver and copper.——The Estella Gold Mining Co., operating near Milford, has completed the installation of a 25-stamp mill. Ore assaying from $10 per ton will be treated.

Ore shipments from the Tintic mining district this week aggregated 143 carloads, the contributing mines being: Eureka Hill, 16; Centennial-Eureka, 36; Yankee Consolidated, 4; Beck Tunnel Consolidated, 5; May Day, 2; Eagle & Blue Bell, 3; Uncle Sam Consolidated, 4; Bullion-Beck, 6; Gemini, 6; Scranton, 4; Dragon Iron, 13; Swansea, 3; South Swansea, 1; Joe Bowers, 1; Carisa, 7; Mammoth, 10; Ajax, 2; Victoria, 9; Grand Central, 9; Godiva (concentrate), 2. In all the output was about 7,000 tons. The Mammoth Mining Co. is mining rich gold ore from the lower levels of the mine. One lot of 98 tons sold this week for $12,143, controls showing 6.7 oz. gold and 2.7 oz. silver.——The Colorado Mining Co., Jesse Knight of Provo, manager, has re-commenced development of its property adjoining the Beck Tunnel

Consolidated.——The shaft at the Farragut mine in North Tintic is down 125 ft.——Ore shipments from the Scotia mine in West Tintic are about to begin.——Interesting developments are taking place on the 1,700 level of the Lower Mammoth mine.——A large new compressor is to replace that now in use at the Centennial-Eureka mine in Tintic.——The sinking of the shaft at the Eagle & Blue Bell mine in Tintic district, from 1,000 to 1,500 ft., has been ordered, it is reported, at the instance of F. Augustus Heinze.

Park City mines last week shipped 2,100 tons of ore to Salt Lake smelters, the shippers and respective amounts being: Daly-Judge (ore), 355 tons; Daly-Judge (zinc middling), 287; Daly-West, 470; Silver King, 600; Little Bell, 333; Keith-Kearns, 31; New York, 13; Jupiter, 11.——A raise from the 900-ft. level of the Daly-West mine, at Park City, has encountered the Little Bell fissure.——June was a prosperous month for the Daly-Judge Co., at Park City, returns from shipments aggregating nearly $50,000.——The Little Bell mine is now shipping ore to Salt Lake smelters, and mine conditions continue encouraging.

The new Garfield smelter of the American Smelting & Refining Co. has begun operation. The plant was 10 months in construction and cost $2,500,000.——The construction of the Boston Consolidated mill at Garfield, designed to treat 5,000 tons of ore per day, is progressing. Concrete foundations are being put in. It will be 60 days before the first steel for the main mill-building is raised. The power-plant, however, is well advanced.

The Utah Copper Co. is stripping the overburden of its Bingham properties and will have the second shovel going in about two weeks.——At the Montezuma mine, in Bingham, ore of shipping grade has been found in both the north and south drift, and a 12-ft. vein has been cut in a west cross-cut.——An order will be placed for a big hoisting plant for the Ohio copper mine at Bingham, and the mine is to be explored at greater depth under supervision of Thomas Weir, who is supposed to be representing F. Augustus Heinze, owner of a majority of the stock tied up on an option. Mr. Weir recently secured options on surrounding property. The annual meeting will be held on August 16, when a new board of directors will be chosen. At the same time a proposition to amend the articles of incorporation to permit a bonded indebtedness of $650,000, and to re-incorporate under laws of some other State than Nebraska, will be taken up. The Mines Exploration Co. is a new concern just organized by officials of the Utah Copper Co. with a capital of $500,000. The incorporators and officers are: Charles M. MacNeill, president; Spencer Penrose, secretary and treasurer; D. C. Jackling, general manager—all of whom are officials of the Utah Copper Co. They, with Edmund Jeussen and C. C. Hamlin of Colorado, complete the board of directors.

The new board of directors chosen at the recent annual meeting of the Consolidated Mercur Gold Mines Co. has organized with John Dern, president; Hubbard W. Reed, vice president; A. Reeves, secretary, and George H. Dern, general manager. The annual report will be issued in about three weeks. —— The Sacramento Gold Mining Co., of Mercur, has shipped another lot of quicksilver amounting to 441 flasks.

Eleven Utah mines declared dividends in July amounting in all to $177,000; the Gemini paying $50,000; Silver King, $50,000; Mammoth, $20,000; Beck Tunnel Consolidated, $25,000; Grand Central, $15,000; Victoria, $10,000; Bullion-Beck, $10,000; Carisa, $5,000; Uncle Sam Consolidated, $5,000; Utah (Fish Springs), $2,000; Sacramento, $5,000.

The management of the United States Smelting, Refining & Mining Co. has placed an order for two more converter-stands, a total of five for the Bingham Junction smelter of that corporation. The concentrator situated near the smelter, which has been running on low-grade silver-lead ore from the Old Jordan and Galena mines at Bingham, will also treat custom ore in future.

Ore shipments are again being made from the Consolidated Flagstaff mine, at Alta. —— Control of the Gipsy Blair property, near Alta, has passed to the officers of the Kennebec Mining Co. The Gipsy Blair will be utilized for a tunnel-site for the Kennebec. —— Shareholders of the Steamboat Mining Co. have ratified the action of the directors in the sale of the property to Jesse Knight, of Provo. The property is in the Big Cottonwood mining district.

CRIPPLE CREEK, August 6.

A car of ore was shipped July 30 from the Trachyte claim of the United Gold Mines Co. on Bull hill, to the Eilers plant at Pueblo of the American Smelting & Refining Co. A rich streak 8 in. wide is being broken by two machines at a depth of 300 ft.; the working width is about two feet. The screening from this ore gives a return of about $70 per ton in gold.

During the month of July the Gold Dollar mine on Beacon hill shipped, on an average, one car of $30 ore per day. The ore is obtained by the company on the eighth level and is shipped with very little sorting. Beginning August 1 the Last Dollar mine, situated on Bull hill, will be worked under lease by John Price and Jesse Waters. The lease is for two years and it is understood that considerable development work will be done to prove up this property. The Bluebird mine, owing to the absence of the owners in Nevada, has been closed down, but will resume work shortly on their return, which is expected to be some time this week.——The last three months have been very favorable for the Vindicator Gold Mining Co. on Bull hill. The average monthly profit was a little over $27,000, which was excellent considering the amount of expense incidental to getting the newly acquired Hull City placer into shape for profitable production. The regular quarterly dividend of $45,000, on three cents per share, has just been paid, making a total disbursement to date of $1,470,000.——The Gold Sovereign mine shipped approximately 1,000 tons of 1½-oz. ore during July, three-quarters of it being mined by lessees and the remainder by the company.

Although the tonnage shipped from the Cripple Creek district during July was a little lower than that of June, yet the grade was sufficiently higher to make the total value about $50,000 greater than for the previous month. ——The Western Investment Co., one of the largest leasing combinations operating in the district, R. A. Miller and the Sacramento Mining Co., are being sued by Becker, Travell and McDonald, in the sum of $10,000 for ore wrongfully extracted by the former parties on the Sacramento claim of the Stratton Estate. A lease was granted to the plaintiffs on the Sacramento claim in August of last year to run for a period of 18 months, work being started immediately. In January last, with the consent of the Sacramento Co., a contract was entered into with R. A. Miller, giving him authority to work the lease for the plaintiffs at the same time conforming to the conditions of the said lease. In consideration of this Miller agreed to pay an additional 5% royalty on all ore shipped by him, over the 20% payable to the Sacramento Co. About three months ago Miller entered into some agreement with the Western Investment Co., whereby the latter company was let into possession of said premises and has since been extracting ore of very fair grade, paying to the Sacramento Co. 20% royalty and to the plaintiffs 5%. This contract between Miller and the Western Investment Co. was made without the knowledge of the Sacramento Co. or of the plaintiffs. The lat-

ter refuse to accept the 5% royalty, or to recognize Miller's right to assign his contract to the Western Investment Co. which has no authority to mine any ore from the Sacramento property. The ore is being mined at a depth of 325 ft. and is being shipped at the rate of a car every other day; it is supposed to be a continuation of the rich orebody which is being worked in the Specimen claim, to the north.

The suit of the Creede & Cripple Creek Mining Co. against the Uinta Mining, Tunnel & Transportation Co. and the Portland Gold Mining Co., which has been in the courts for several years, has been finally settled by mutual agreement. A tunnel right of way through the Portland property was sought by the plaintiff company, which was granted by the district court of El Paso county, but this decision was reversed by the United States Court at Denver, where the case was taken by the defendants. The case was then carried to the Court of Appeals, where the right to tunnel through the Portland property was again denied the plaintiff company. The final settlement was made out of court between the three companies and the papers were filed in the district court of El Paso county on August 4. In the articles of agreement, while the tunnel is not allowed, certain concessions are made by the three companies.

It is stated on good authority that papers are shortly to be filed with the Secretary of State incorporating the Cripple Creek Drainage & Tunnel Company for the purpose of driving the deep drainage adit for unwatering the district. One million shares, of a par value of $1 will be the capitalization, and each company interested will purchase a block of stock. The following constitute the board of directors: Frank S. Castello of the Mary McKinney, Frank G. Peck of the Portland, Sherwood Aldrich of the Elkton, S. S. Bernard of the El Paso, F. J. Campbell of the Vindicator, A. E. Carlton of the Findley, C. C. Hamlin of the Granite, and William J. Chinn and J. A. Ritter, attorneys of Colorado Springs. The two last named gentlemen will resign as soon as representatives from two other mining companies are elected.

DENVER, August 1.

The Portland Gold Mining Co. has filed suits against Stratton's Independence Co. and numerous lessees, for various amounts aggregating $360,000. W. S. Stratton and the Portland Gold Mining Co. agreed upon a vertical boundary-line years ago, so there will be none of the expense and complexity about this suit that usually attends apex cases. It is pretty hard for anyone, and particularly for a lessee, to quit good ore because he is getting close to his neighbor's line. He probably does not know exactly where the line is, and gives himself the benefit of the doubt, to the extent of a foot or two. There seems to have been nine different cases of this kind for which the Portland Co. seeks redress. The amounts sued for are very likely greatly in excess of the gross value of the ore removed, to say nothing of its net value. The suits are brought in the U. S. district court.

Camp Harrington is the name given the new camp on the Tennessee fork of the Arkansas, above Leadville. I have previously mentioned the discovery of good bodies of ore in this range a little farther south. The Jennie June, at Camp Harrington, which has attracted considerable attention lately, has just changed hands. James Shinn, of Leadville, has been appointed superintendent and will install a hoisting plant.

The Clear Creek basin continues to lead the State in the number of new strikes. I cannot say, however, whether the discoveries are of as great importance as those of other districts. For instance, the discovery of a new orebody at Leadville, such as was made in the Mammoth, is apt to mean more to the State than the discovery of several Clear Creek basin ore-shoots. One of the latest strikes was in the Sleepy drift of the Marshall tunnel in Equator ground at Georgetown, where 8 to 12 ft. of 400 oz. silver ore is reported. Another strike was made at Empire in the Denver City property, and another in the American Sisters mine at Georgetown. The Two American Sisters Mining, Milling, Power & Electric Co. is the official name of the company, and it is putting in considerable machinery, including a 550-h.p. hydro-electric plant. If its pocket-book is as long as its name it ought to have a fine plant, and it is generally believed that it has a good mine.——L. G. Nesmith, of Central City, has gone East to arrange for re-opening the old Kirk mine on Quartz hill. The mine has lots of uranium ore as well as some gold-milling material, but it needs a new hoist to get it out.

One of the most important developments going on this summer is the continuation of the Yak tunnel at Leadville under Big Evans gulch. Leadville is naturally a wet camp, and the discoveries in that district warrant active prospecting. The draining of the ground will greatly facilitate prospecting, and some big discoveries ought to be made.

DENVER, August 6.

Very little has been heard of Rico since the consolidation of the big mines there, a few years ago. At that time great predictions were made of the brilliant future of the camp. The work of development was placed in the hands of a clever young engineer. An attack of pneumonia carried off the engineer, development work stopped, and everything came to a standstill. Apparently the company could find no one else in whom they had confidence, so nothing was done. This year, however, the mines have started up again on the leasing system and heavy shipments of ore are being made. Underneath the very town of Rico, and extending under Newman hill, is an enormous body of zinc-lead ore. It is called the Atlantic Cable deposit and is considered one of the largest known orebodies in the State of Colorado. Needless to say, there are difficulties attending its exploration or it would be more energetically worked. The ground is wet and the average grade is low. The rise in the price of zinc makes possible the mining and shipment of the richer parts of this vast lode, and this summer the production is so heavy that the railroad finds itself short of cars on the Rico division. Most of the tonnage is hoisted through the Atlantic Cable shaft. Rico also yields a considerable tonnage of the typical high-grade silver ore, such as made the Enterprise and Rico Aspen famous in the early days. The camp undoubtedly needs a concentrating mill. With the modern improved methods of treating zinc ore there would be no trouble in making a clean separation of the zinc and lead, and that is all that is needed to make profitable the mining of thousands of tons of ore in Rico which are already developed. It is understood that A. B. Roeder, the promoter and manager of the United Rico Mines Co., is now working on plans for a mill of large capacity.

The old Neigold property, above Silverton, has long been one of the famous mines of the San Juan. Old man Neigold firmly believed that he had millions of tons of high-grade ore actually developed. It was a bad case of self-deception. That he had a most remarkable property every one who saw it agreed, but the old man's conception of its value was far beyond conservative consideration. How the Old Hundred Mining Co. managed to get hold of the property I do not know, but it did, and this summer its new 40-stamp mill is contributing to the stream of white and yellow metal which western energy and brains coax and crush out of the heart of the Rocky

Mountains. Robert W. Davis, Jr., the manager, is an experienced millman, and he has undoubtedly put up a fine mill.

The Clear Creek basin demands notice again this week. It is remarkable what a lot of good strikes they are making up there this summer and what a lot is going on in a quiet unpretentious way. It is true that the chambers of commerce at each of the three towns, Idaho Springs, Georgetown and Central City, are making a special effort to advertise the country this summer, but this is rather the outcome of the prosperity that has come to them, than the cause of it. At Georgetown the Lima Con. Mining Co. finds itself in need of a new mill and a couple of new tramways. They are operating on Republican mountain. The mill, I understand, is to be erected below the portal of what is called the Moline cross-cut. The officers of this company are all local people of recognized standing, and the chances are that when such people find something that is good enough to equip with a mill and too good to sell to an outside company, it is very good indeed. William C. Hood is the manager and Frank Maxwell, the well-known surveyor and mining engineer, is president. The best ore ever found in the Newhouse tunnel was struck in the Saratoga lateral last Monday. This strike is fully as important as the famous Gem discovery of 18 months ago, but people have become so used to hearing that the extensions of famous ore-shoots have been cut in deep cross-cut tunnels that little interest is aroused when another is stated to have been found. In this case it is the extension in depth of the famous Saratoga shoot that has been cut. The vein is a foot wide and assays $171.60 per ton.

The Big Five has succeeded in getting the $100,000 that it was planned to raise before beginning work again on its long adit. This money assures the pushing of the 'tunnel' into the country of big producers, at the head of Virginia gulch, before the work ceases. It reminds me that Ben Owens and associates have taken up the famous old Crown Point and Virginia mines at the head of Virginia gulch, and are going to operate them actively. The Newhouse tunnel has partially drained the ground, so that operating expenses will be much less than at the time when they were shut down.

The Argentine Central was formally opened last week. This little railroad runs from Silver Plume past the Wilcox mining properties to the summit of McClelland mountain, 14,000 ft. above sea-level. I believe it is the highest railroad in the world except the Peruvian Central which crosses the Andes at over 15,000 feet.

TORONTO, August 3.

Thomas W. Gibson, Deputy Minister of Mines, has received further reports from Prof. W. G. Miller, in charge of the exploration party prospecting the Gillies timber limit near Cobalt, from which it appears that recent discoveries of ore are richer than at first imagined. So far 65 ft. of the vein has been uncovered. Prof. Miller's samples were sent to the Provincial assay-office. One carried 1,936 oz.; the other 2,957 oz. silver per ton.

Among American capitalists visiting Cobalt recently was a party from Pittsburg and other Pennsylvania cities, including A. P. Macauley, Richard McCormack, P. J. McCormack, Mayor Black of McKeesport, Bernard Volk and Squire Richards. After a careful inspection of conditions they secured 44% of the stock of the Eureka Silver Mining Co., which owns a producing mine with the moderate capitalization of $100,000. They intend to operate it on a more extensive scale. They wished to secure a controlling interest, but the Toronto stockholders declined to sell it. The party looked into other propositions and secured samples of ore for assay, so that other investments are expected to result.

Reports concerning the finding of diamonds in New Ontario continue to be extensively circulated. The officials of the Provincial Department of Mines do not attach any significance to these stories, which crop up periodically every few months. Geological experts do not regard it as at all probable that diamonds will be found in place in this Province, though it is possible that occasional gems may be picked up in the glacial drift, as has been the case in the adjoining northwestern States.

J. Lauzon has returned to Sudbury, Ont., from a prospecting trip to the new Lake Opastica goldfields. He was very favorably impressed with the region, stating that gold is plentiful and the deposits easily worked. He secured a location, samples from which assayed $21 per ton, and will proceed to develop it. The principal drawback is the Quebec mining law, which retards enterprise by permitting individuals to monopolize large areas. Some holdings extend over 150 square miles, from which all other prospectors can be excluded.

The facts respecting the deal under which the Right of Way Mining Co., of Ottawa, secured the mining concessions on the Temiskaming & Northern Ontario Railway, have created so much adverse comment that the Provincial Government will probably cancel the agreement and call for fresh tenders. It appears that the terms on which the concession was granted by the Temiskaming & Northern Ontario Railway Commission were considerably varied from those specified in the call for tenders. The latter provided for a royalty on the output, at a rate varying from 10 to 50% of the value according to the grade of the ore. This the company refused to accede to, so the terms were varied, making the royalty a flat rate of 25% of the value of all ore mined. This disclosure, coupled with the fact that the principal promoter of the company is the son of Dennis Murphy, a member of the Commission, aroused public opinion so strongly that the transaction will probably go no further. As all official acts of the Commission must be ratified by the Government, the final step has not yet been taken. The press is calling for the dismissal of Mr. Murphy.

Iron ore has been discovered by W. A. Cockburn, of Sturgeon Falls, Ont., in Kirkpatrick township, two miles south of Verner station, on the Canadian Pacific. The vein is about 25 ft. wide.

The Canadian Pacific Railway is making tests on an extensive scale at Medicine Hat, Alberta, to determine the presence of oil underlying the natural gas. Nine carloads of modern machinery have arrived, comprising a cable-rigged drilling outfit and drill-pipes sufficient to reach a depth of 3,500 ft. Coal has been discovered within a few miles of Battleford, between the Saskatchewan and Battleford rivers. The prospector refuses to divulge the exact whereabouts of the deposit, until he succeeds in getting capital interested with a view to its development.

TORONTO, August 5.

The Provincial Government of Ontario yesterday definitely refused to sanction the mining concession made by the Temiskaming & Northern Ontario Railroad Commission to the Right of Way Mining Co. New tenders will be called for. The company, which claims to have acted in good faith, will claim reimbursement of expenses incurred and threaten a lawsuit unless compensated. This matter has aroused much interest.

A party of Toledo, Ohio, capitalists is investigating the silver mines in the Port Arthur district with a view to re-opening them, should investigation prove satisfactory. These mines include the East End Silver Mountain, West End Silver Mountain, Badger, Porcupine, and Keystone properties, which in the early days were good producing mines, but closed down when the depression in

the price of silver rendered it impossible to work them profitably. There is no doubt that they still contain rich veins of ore.

BISBEE, August 5.

At the Copper Queen smelter there was a little falling off in the output last month, on account of the two days' shut-down at the beginning of the month, and owing to the caving of the Holbrook shaft, which decreased ore shipments considerably. The output for the month o July was about 7,750,000 lb. copper. The precipitating plant at Bisbee has proved a success, saving about 80% of the copper contained in the water. The new compressor at the Czar shaft has been completed and is now in use. The management of the Copper Queen Co. is working on a plan to inaugurate a new system of hauling ore from the lower levels. The plan is not yet completed, but the general idea is to hoist all the ore through the Gardiner and Spray shafts by means of electric power. A large plant will be built on Sacramento hill to furnish the necessary power. The Holbrook shaft, that is the new one, will be used only for hoisting men and timbers; it is to be put down at a distance of about 150 ft. from the old one.

At the Calumet & Arizona smelter, the July production was 3,854,000 lb. copper. Everything is about the same as usual at the smelter and at the mines.——At the Lake Superior & Pittsburg shaft the foundation for the new hoist has been completed. The work of constructing the new engine-house has been started, and the boilers will be put in position this week. As soon as the engine-house is completed, the new hoist will be erected. On Wednesday a body of rich sulphide ore was opened up on the 1,000-ft. level of the Calumet & Pittsburg. The work is still in ore. Sinking continues at the Junction. At the Hoatson, the pumping plant being installed on the 1150-ft. level will be completed this week, and then sinking will be resumed.

At the Shattuck & Arizona preparations for the shipment of ore are being pushed forward. On the 600-ft. level the work is in a body of oxide and carbonate ore which is showing up satisfactorily. On the 700 two high-grade sulphide orebodies are being opened up. On the 800 the drift is in low-grade sulphide. The two raises from the 800 to the 700-ft. level are progressing rapidly. The ore-bins have been completed. They have a capacity of 1,000 tons. The cables for the tramway are being strung, and will be in position this week. The new steel head-frame was erected this week and will be put into commission on Thursday. There are two new boilers on the ground, and as soon as the preparations for shipping have been completed, they will be set up. The railroad spur will be ready for use August 12. A new building will be erected to contain offices for the superintendent, the chief engineer, the chief clerk, and the assay department. The water-supply has been falling off, but on Friday a flow of 150 gal. per min. was struck on the 800-ft. level. Striking water has been an invariable forerunner of an orebody in the Shattuck.

At the Denn-Arizona, they are still sinking the shaft, and are down about 1,060 ft. A body of iron ore was encountered in the shaft about ten days ago, and has not been penetrated yet. The character of it changed a little on Friday, when some vein-matter and soft material were opened up. On the 1,000-ft. level, the iron orebody encountered about three weeks ago was penetrated, and a body of manganese exposed. It will be but a very short time before an orebody is opened up, according to the best advice.

The main interest here this week has been centered in the transfer of the Cananea-Duluth, American, and Bryan properties at Cananea, by the Cole-Greene interests. The deal has not been entirely closed as yet, the apportionment of stock remaining to be fixed. The new company will be called the Cananea-Central, with a capitalization of $10,000,000, or 1,000,000 shares of $10 each. The stock market here has been very active this week.

CANANEA, Mexico, August 6.

A company which has been mining a rich silver mine in the Ajos mountains for the past three years and which has escaped notice, owing to the policy of the management, is the Alsace Mining Co. This company is composed of a number of Frenchmen who are putting their own money into the property and are working it on shares. The result has been that they are all getting rich, for the mine has turned out to be a property of great value. No stock has been issued. The ore is said to assay about 450 oz. silver, 2.5 oz. gold and from 4 to 15% copper; it is packed to the railroad and shipped to El Paso.

The development of the Llanos de Oro placers, by the company of which Epes Randolph and associates are the owners, has proved several facts not hitherto suspected concerning these deposits. It has been demonstrated that there are two beds, one above the other, with a false bedrock between, at a depth of from 15 to 50 ft. In the Llanos de Oro mine at 105 ft. the lower bed has been found; the gold occurs in the form of fine shot and nuggets, mixed with large pieces of country rock. The conglomerate mass shows that it has been subjected to the action of water only slightly. This lower bed of ore has been opened up extensively, and it is said that there is about $8,000,000 worth of it in sight. The 100-stamp mill on the property is only using 50 heads at present, but it is expected that the full battery will be dropping before September.——The Boston Copper Co. has let a contract for the sinking of five diamond-drill holes on its property in the Ajos mountains. These holes are to be sunk 300 ft. and it is expected that the orebodies will be tested in this manner at a much less cost than by using ordinary prospecting methods.——The Brooks Con. Copper Co. will reach ore in 25 ft. in their main shaft on their property in the Cerro Tordillo district, about 30 miles east of Cananea. At present small stringers of high-grade ore have been found and the water in the shaft is tainted strongly with copper. ——J. P. Chase, in the same district, has run into ore which assays 15% copper, 40 to 60 oz. silver and $3 gold. The vein is seven feet wide and gives every indication of increasing in size and value.——B. F. Pinson has denounced 160 acres in the Ajos mountains, 70 miles east of Cananea. Assays from the surface give from 3 to 20% copper, 20 to 35 oz. silver and about $4 gold.

The developments for the past week in the mines of the Cananea Con. Copper Co. are as follows: At Cobre Grande mine No. 2 a cage, hoist, and 80-h.p. boiler have been installed. At the Henrietta mine an air-shaft has been started to connect with the main adit at a depth of 87 ft. A gravity tram was put into operation at the Puertocito mine and is being used to quarry the face of the hill, which consists of low-grade ore. This ore is being shipped to the smelter as fast as it is taken out, as it is the best smelting ore in all the mines. A No. 7 Cameron sinking pump has been placed in the main shaft of this mine, and the new air-compressor is working and giving great satisfaction. It is of 13-drill power. The shaft at Veta 8 is being sunk rapidly, and has reached the 110-ft. level. At 260 ft. a drift will be run to meet the shaft at Veta 5. Thirty feet of ore has been cut in Veta 8 and indications are that more will be found before starting the drift.

The Cananea Eastern Mining Co. has 70 ft. more to run on the adit which is being driven to cut the lode, at a depth of 200 feet.

Mining Summary.

ALASKA.

Alaska gold shipments for 1906 now reach $10,562,870—nearly as much as they did at the close of last season. A total of 22 shipments has been made from the country. Of these half came from the vessels sailing to Nome and St. Michael direct, and gold aggregating $4,618,000 was brought down by them. From the southeastern section, 11 shipments were received, totaling $5,944,870. A total of 18 vessels has made the round trip to either Nome or St. Michael; only 664 have returned up to this time direct from those ports.

Reports from Rock creek, near Glacier creek, say that the work done there last winter is beginning to bear fruit. The Nome Quartz Mining Co. has been working on the Gold Reef quartz claim there since October. Work was begun on a shaft, which was put down 70 ft., and a cross-cut run to the vein. The ore contains pyrite, mispickel, and gold.——The Wild Goose Co. has been operating on Dry creek for some time, and has succeeded in finding the old beach line. There is said to be good pay on the bedrock. The company is moving a hoist and outfit on to the new strike from the Honey claim.——Nels Christenson and Adams & Ashley are sinking holes in the vicinity of the new strike.——L. L. Bales says the story of recent remarkable gold discoveries on the Alaska peninsula is exaggerated. He was recently at Sand point and states that the deposits found there, and at St. John, are of the kind that can be found anywhere on the peninsula.

ARIZONA.

COCHISE COUNTY.

The shaft on the Tombstone Consolidated Mines Co.'s Silver Thread property, being drained by the pumps at the Grand Central shaft, was sunk to water level 600 ft. below the surface, where a new high-grade orebody was encountered. A drift was started at water level which passed through the upper portion of a new shoot of ore. The shaft where the ore was encountered was sunk from water level through solid ore to a depth of 100 ft., where a drift has been run for 80 ft., and is still in ore.

GRAHAM COUNTY.

(Special Correspondence).—On Friday evening, July 21, John Chisholm, Jose Alarcon and Leandro Vasquez lost their lives by a cave in the Coronado mine, of the Arizona Copper Co. at Metcalf. After the accident the entombed miners communicated with the other miners, but before they could be reached they were dead.——The Stephens claims, on American mountain, are reported to be showing up favorably. George Stephens, who is operating the Stephens mine under a lease, reports that the vein of rich ore recently discovered is four feet wide and will average 26% copper. He is also developing a body of sulphides in another part of the mine which assays 8% copper. The management of the Gold Belt Development & Reduction Co. reports the discovery of manganese ore which assays 25% copper. A shipment will be made to the Detroit Copper Co.'s smelter at this place.——The June production of the Shannon Copper Co. was 738,000 lb., as compared to the May production of 1,230,000 lb., due to the fire at the top of the incline, which necessitated shutting down the works for more than two weeks. Normal production was resumed June 27.

The development at the Shannon mines is entirely in new orebodies, and the ore reserves are now larger than ever before.——Nathan F. Leopold, of Chicago, who is interested with the Phelps-Dodge people in the Burro Mountain Copper Co., spent a few days in camp as a guest of C. E. Mills, superintendent of the Detroit Copper Co.——The electric power-line has been completed to the three claims of the Detroit Copper Co., six miles from town, in the Copper Mountain district, and the installing of machinery is finished. This company is putting in a 75-h.p. motor at the Santa Rosa, which will operate blowers and other machinery. The adit at this claim is in over 400 ft. At the Esperanza mine, which has heretofore been operated by a horse-whim, a 40-h.p. motor is being installed. The shaft here is down 215 ft. At the North Dakota property a 40-h.p. hoist is also being put in, the shaft being down 400 ft. The line has already been surveyed, and the company will soon extend its tunnel now running through Copper mountain to the above claims, and it is reported that in a short time this line will be extended to Metcalf, when the Detroit Copper Co. can make a bid for custom ores of that district.——Charles T. Roberts, superintendent of the Omega mine, controlled by the Zackendorff interests, reports that on the 800-ft. level the biggest strike in the history of the mine has been made.——Concentrator No. 6, recently completed by the Arizona Copper Co., is now running two eight-hour shifts, the mill being shut down the other eight hours so that carpenters can finish the wood work. Large settling-tanks for restraining and drying the tailing will be completed in four weeks. It is the intention to use the tailing to fill underground workings, thus settling the debris problem.

The Longfellow gravity-incline, owned by the Arizona Copper Co., has been extended 200 ft. at the upper end to the level of the Humboldt and Clay mines and the new adit workings, connecting with the electric road now running to all these points.——T. H. Scott, superintendent of the Scott-Allen gold claims two miles below Morenci, will resume work at the mine and will ship ore to the El Paso smelters.

Morenci, August 4.

MARICOPA COUNTY.

(Special Correspondence).—The Arizona Development Co. is arranging to begin work on its property situated in Frog Tank district, 20 miles from here. Mr. Hamilton, who is the principal promoter and president of the venture, is negotiating for the purchase of a Keystone drilling machine which will be taken to the company's claims near the junction of Agua Fria river and Castle creek where several holes will be sunk to determine the character of the ore and what machinery is necessary and what development work must be done.——James C. Dobbins has placed on file location notices of 52 placer claims for the Arizona Development Co. The locators number about 40 people, the greater number of whom are residents of this city and county. The claims lie along the banks of the Agua Fria and Castle creek.——The Arizona Placer Mining Co. will probably also buy a Keystone driller. J. C. Hall is now in Los Angeles for this purpose.——The Arizona Placer Mining Co.'s property is situated above Wickenburg, on the Hassayampa. Below Wickenburg on the same river, the Hassayampa Placer Mining Co. had a Keystone machine in operation some time ago. The results were stated to be satisfactory.

Phœnix, July 28.

(Special Correspondence).—J. R. Chapton has had men during the past four months developing the Copper Monarch group, owned by W. J. Bryant, at Los Angeles. It is situated in the Eagle Tail mountains, 80 miles west of Phœnix, and was formerly known as the Volcanic. Some 12 years ago $150,000 was spent on the property, when several shafts were sunk, but none of them on a vein. Last spring Mr. Chapton began an adit which is now in 175 ft. At 130 ft. a 20-ft. vein was crossed, carrying low-grade copper ore with some silver and gold. On the hanging wall of the vein, in the adit, there was a small rich streak on which a drift was run 30 ft. and it has widened to two feet. Several tons of shipping ore have been taken from this drift. The continuation of the main adit will cut three more veins of good width. One vein discovered on July 7 is from 4½ to 6 ft. wide. The ore, at a depth of five feet, shows gray-copper rich in silver. Two shipments of ore have been made since May with good results.——Another gold and copper property, owned by a Mr. Eaton, four miles north of the Chapton property, looks promising. Mr. Eaton will soon begin shipping ore by way of Salome, 25 miles distant.——There is also the Venture Mining Co.'s property situated seven miles southeast of the Monarch. This mine contains gold and copper, and a mill is to be erected. Water has been developed by this company and also by others who have good claims in the district.

Phœnix, August 4.

CALIFORNIA.

ALAMEDA COUNTY.

The American Magnesite Co., at Red Mountain, is operating large mines of magnesite which is being delivered at Livermore. Four traction trains are on the road regularly, and make the round trip from Livermore to Red Mountain every 20 days. It is the intention to mine 200 tons per day. These engines handle 140 tons of ore on each trip. Work is now being prosecuted on the Alameda claim, where there is a body of ore 85 ft. wide. The ore is quarried not far from the summit of Red Mountain, carried through a chute to adit No. 1, trammed in cars to the upper bunker, and carried by aerial tramway to the lower bunkers, where it is kept to await the arrival of the traction-trains. C. H. Spinks is superintendent.

AMADOR COUNTY.

The Mitchell mine near Pine Grove is again running, 14 men being employed. Ten stamps of the mill are in operation. The climax mine is also running on a small scale. Only four or five men are employed. T. B. Aitken is superintendent.——The Lucas mine, situated on the Calaveras side of the Mokelumne river, is being operated by a company, which also runs the Tripp mill of 10 stamps on the Amador side. An eight-foot vein has been exposed, carrying free gold and a good percentage of sulphurets.

ELDORADO COUNTY.

Crane & Mooney are working the old Mulkey claim at Cedar Grove, where they have opened up some good gravel. ——Maylone & Papinau are ready to turn the water on their claim at Cedar Creek. They have put in a big derrick for moving the rock.——The Phelps mine is running full blast night and day. The adit is in 500 ft. and will tap the channel in three months. Some of the mines around Indian Diggings are working. The company that is opening up the old Hickey claim is installing a big hydraulic plant, and will put in a long string of flume.

INYO COUNTY.

A new excitement is reported in the vicinity of Summit. Four miles from the camp the mineral belt is a mile wide, broad parallel lodes outcropping in many places. The ore is principally sugar quartz, considered worthless until two weeks ago, when samples assayed gave such returns that locating began at a lively rate. It is said that the surface horns at almost any spot. Nichols, the discoverer, began work on a 2½ ft. vein, showing $3 ore on top; at 10 ft. deep he is getting $20 assays. Nicholasville is a townsite laid out by Nichols, Unthank and Granger. It is on the railroad at the foot of the mountain, two miles from Shanghai and five from Buena Vista. The owners are sinking a well. Steady work is going on in the older mines around Buena Vista. Twelve men are employed on the Brownie, and the Buena Vista, Tip Top and others are keeping many more busy.

MONO COUNTY.

The new machinery for the Southern Belle mine, at Bodie, is expected daily.——The Bullion shaft is now down 255 feet.

NEVADA COUNTY.

(Special Correspondence).—At the Eclipse mine, Gold Flat, owned by Simmons Bros. and bonded to Tonopah people, they have struck ore showing gold freely, in the drift on the 220-ft. level. This is a continuation of the rich ore-shoot which produced $6,200 from 50 tons of ore. They are crushing the ore in the 10-stamp Phœnix mill of the adjoining property.

Gold Flat, July 30.

Joseph Weissbein, manager of the Gold Flat mine, near Grass Valley, reports that it took one week to lower the water in the 350-ft. incline and drain the drifts and stopes. Everything was found to be in good condition and sinking will be commenced immediately, as it is intended to drive ahead 1,000 ft. and thoroughly develop the Gold Flat.

Five claims in Deadman's Flat have been sold to the Gold Mound Mining Co. of Spokane, Wash. The claims were owned by W. George, J. M. Othet, A. B. Adams, Arthur Cook, George Trotter, H. Reber, and others. They include the Boycle & Roach, Gold Cup, '1903,' West Virginia and Lucky Boy, and are situated near the Baltic.

SHASTA COUNTY.

Ore is being hauled from the George Stanton mine, near French Gulch, to the railroad, for shipment to the Selby smelter.

SISKIYOU COUNTY.

W. H. Young, general manager of the Gold Ball mine, owned by the California Consolidated Mining Co., says that the vein for which they have been running in the lower level of the mine was recently struck, and sinking is in progress. It is five feet wide and will mill $20 per ton. The company will make arrangements to handle the mine on an extensive scale, and will install an electric-power plant near Sawyer's Bar and will add a lot of new machinery, including an air compressor, machine-drills and hoisting works.——N. E. Graves, superintendent of the Sheba mine near Fort Jones, says he has recently struck the rich shoot of ore in the lower level of the mine.

TUOLUMNE COUNTY.

(Special Correspondence).—An adit that will cut the vein at a depth of 450 ft. is being driven at the Bourbon mine, in the Jupiter district. —— At the Saratoga Mining & Development Co.'s mine, at Mountain Brow, near Columbia, an incline shaft that will connect with the long adit has been commenced. A night shift has been added to the force. —— The Dondero gravel mine, near Yankee Hill, and the adjoining property owned by Antone Podesto, have been bonded to Hildreth & Dennison. —— The water has been lowered below the 400-ft. level in the Davidson shaft of the Soulsby mine, and a 10-in. pump is being installed at that level. Sinking continues in the Pennsylvania shaft, now 700 ft. deep.

Tuolumne, August 6.

William Sharwood and wife have entered into an agreement with the Bagdad-Chase Gold Mining Co. to sell the Soulsby mine and adjacent mining property, with all improvements thereon, for $200,000, to be paid in installments as follows: $50,000 in 12 months, $50,000 in 18 months, and $100,000 in 24 months, from January 10, 1906.——It is understood that work is to be resumed in several of the old mining claims in this county—not in the well-known mines, but prospects that were dug and abandoned in the early '50s, when quartz mining was in its infancy.

COLORADO.

CUSTER COUNTY.

At 68 ft. depth in the Bismuth, the lessees, Stroehlke & Preston, have ore in the drift after driving 30 ft. from the shaft. The entire drift is in ore running 16 oz. silver. Through the centre of the vein runs a three-inch streak of ore resembling gray copper and showing horn-silver. An average sample from this streak assayed 1,818 oz. silver, or about $1,000 per ton.

GILPIN COUNTY.

W. F. Hogan, the new manager of the Gunnell property west of Nevadaville, says that a temporary hoist will be installed on the pump-shaft to clean it out and to re-timber that shaft, which has been idle since the fire destroyed the surface plant in March, 1904. When the work is completed the company will arrange for a plant capable of hoisting from a depth of 2,000 ft. If possible the pumps may be fixed up and used, but if they are found to be in bad condition the new company will install a new equipment. The company will not interfere with the present leasing system on the Grand Army and West Whiting mines, which are doing well, but will encourage leasing. Improvements will be made in the mills at Black Hawk.——In order to demonstrate the comparative results in marketing the medium-grade ores from the Old Town mine, George K. Kimball, the manager, made two tests. One lot of 120 tons was sampled at the ore buyers, for which, under the smelting schedule, he would have received $23 per ton net. The lot of ore was then treated at the Jackson mill, making 35 tons of concentrate for which he received, deducting mill charges on the ore, freight, hauling and smelter treatment, $89 per ton. The mill saved 92% of the gold, 72% of the silver and 58.2%

of the copper content, and Mr. Kimball received close to $2.50 per ton more by treating his ore by concentration than he would have received by selling direct to the sampling works.——Another lot of 105 tons was treated at the Alpine mill where a saving of 90% of the gold, 90.7% of the silver and 50% of the copper was made. The sampling works offered $2,144 for the shipment, but by concentration to 29.4 tons, deducting all expenses Mr. Kimball received $2,338, or a profit of $194 by milling the ore instead of selling direct to the smelters.

OURAY COUNTY.

L. A. Thompson, general manager, and V. W. Mather, foreman, of the Mickey Breen mine of the Tempest Apex Co., who disappeared several days ago, were found dead August 3 under a mass of debris in a small tunnel half a mile from the Breen mine. They evidently sought refuge in the tunnel from a cloudburst, and were overwhelmed by the rocks and dirt that washed into the opening from the mountainside.

SUMMIT COUNTY.

(Special Correspondence).—Owners of the Washington mine have decided to put in additional concentrating and separating machinery to handle the zinc content of their ore.——The Little Sallie Barber mine is now working on ore at the 100-ft. level and the product, which assays $2 gold, $13 in silver and a little lead, is shipped.——The Senator mine on the Upper Blue is opening up well. A number of stockholders recently visited the mine and adjoining properties and are well pleased with the progress made.——The Bullion King on Gibson hill is being developed by Foote & Hight under lease and has made a record production of high-grade zinc ore. King & Hammel, sub-lessees, have opened an 18-in. vein of lead carbonate on the surface.——In the Old Union mine it is expected that connection will soon be made between the main adit and old surface workings, which will afford cheaper working activities and better ventilation.——The mill on the lucky mine is working on the low-grade ore, making good grade of concentrate. A new strike of high-grade shipping ore has just been made. ——At Kokomo, activity is apparent everywhere, and the results of milling tests on the complex zinc ores having been favorable, the old zinc properties are fast being revived.—— At the Wilfley mine a furnace is being erected to prepare the more complete zinc, lead, and iron ore for treatment by electro-magnetic separators.——On the Felicia Grace an important strike has been made. This property is being operated by Leadville men. The present owners took possession early the past spring and sunk a 180-ft. shaft. At 110 ft. a drift was run to the old workings and in doing this a new orebody was cut, samples of which assay $5 gold, 80 oz. silver, and 30 to 40% lead. The upper contact also contains considerable pay-ore and this mine will soon be among the shippers.

Breckenridge, August 4.

TELLER COUNTY.

Experiments are now being made in the treatment of the low-grade ore, both sulphide and oxidized, on Gold hill. The Lexington Co. has sent a trial shipment of $10 and $12 ore to the Craig cyanide mill at Anaconda, the milling company having fitted up special machinery for this purpose. There is a great deal of low-grade ore in the Clara D., and on Ironclad and Globe hills there is much low-grade ore of similar kind.——Bull hill also has much oxidized ore, and the mill being built by the Isabella Co. will have several bodies to work on. There is a shoot running through the Isabella to the Victor, which runs $10 per ton. In the past, attention has been given principally to the high-grade ore, but conditions now justify the treating of that of lower grade.

The Lonaconing mine on Beacon hill, now under lease to A. E. & L. G. Carlton, is one of the best shippers in that part of the camp. Its output has steadily increased from the time the operations of the present lessees began. The ore is obtained at a depth of 300 ft. It is likely that the Lonaconing will be able to maintain its present rate of production for several months.

Some unfavorable assays are reported by Cripple Creek men who went to the Spaulding district and staked claims at Ilse several weeks ago. The rock looks like ore, but in most cases is too low grade to make even cyaniding ore. W. O. Burnside and W. L. Smith have the best showing to date, and have assays averaging $5.60 across a 14-ft. vein in a 50-ft. shaft on the Custer claim. On four other claims of these prospectors, the following figures were obtained: Hoza $8, Franklin $1.20, B. S. $0.80, and the School Section $1.20. The four last assays were obtained at surface.

There has been so much rain in the Cripple Creek district during the last 30 days that practically every shallow shaft in the camp has been affected. The water is deluging many leases and prospect work has been nearly at a standstill. There are several mines where the shafts are down to 200 and 300 ft. that have been troubled with water.——The War Eagles, on Bull hill, last week got out all the water in the shaft. Three shifts of men have been continually employed in hoisting water.

IDAHO.

BLAINE COUNTY.

In Wood River mining district, the Flynn Con. Mines Co., organized by Butte men, has an orebody outcropping 318 ft. thick at the base and 92 ft. high. In another place 18 ft. of ore has been developed on both sides of a gulch. The property is 18 miles northwest of Ketchum, and consists of 14 claims adjoining the Dollarhide mine.

LEMHI COUNTY.

G. G. Shallabarger and G. C. Wegele, of Horton, Kas., have been inspecting the works of the Gold Ridge Mining Co., at Leesburg. The adit has been run in ore 200 ft. and will be driven 2,500 ft. It is the intention to install a mill in a short time.

SHOSHONE COUNTY.

At last reports the orebody recently cut in the New Hope mine, on Two Mile Creek, three miles from Osburn, has widened to 15 ft. Most of the ore is galena, and there is said to be considerable shipping rock in sight.——The Bunker Hill & Sullivan Mining Co. has given an eight-hour day to its employees. No change is made in the wages paid in any department.——A report from Mullan states that on August 3, 16 shaftmen employed at the Morning mine, owned by the Federal Co., struck for a six-hour day, or for $5 per day for an eight-hour shift. The men have been working eight hours for $4, but claim that as other miners have been given a reduction of two hours per day they should receive the same. The miners in the upper workings of the Stanley Consolidated Mining & Milling Co., which is developing a group of claims on Gorge gulch above Burke, quit and demanded their pay. The company refused the eight-hour day and paid them off. In the lower workings of the property the eight-hour shift has been in vogue for some time.

The management of the Eureka Mining Co., developing a group of claims up Nine Mile creek, near Wallace, is preparing to construct a flume and a compressor plant in the near future. Grading is under way. The flume is to be 2 by 3 ft. and 2,000 ft. long. Angus Marshall is manager.

MONTANA.

GRANITE COUNTY.

The Goodhope Mining Co. at Phillipsburg, on August 3, shipped four bars of silver bullion from the Hope mill. They were valued at $5,300.——Although the Granite Mountain Bi-metallic property is idle, lessees and prospectors are active about Phillipsburg. Ore shipments average 50 to 75 tons per week. This tonnage is distributed among a large number of lessees, each of whom is making more than wages. When the Granite Bi-metallic company was operating nearly all the men in the district were employed by it, but since the suspension these men have scattered in the hills, secured leases on properties that were idle before, and are now opening them up in good shape.

MEAGHER COUNTY.

Material for the new cyanide plant at the Gold Reef mines, on South Boulder, has arrived at Flint, and is being moved to the mine. The plant will have a capacity of 20 tons daily and is to treat tailing as well as ore. The gold in this ore is not entirely free and could not be treated in the mill designed to handle free ore only. Experiments showed that it was amenable to the cyanide process. J. H. Price

is superintendent.——The Terry cyanide plant, built this summer to treat tailing from the Royal, in the same district, is working successfully.

NEVADA.

NYE COUNTY.

The recent labor disputes at Tonopah and Goldfield resulted in the following arrangement: An eight-hour day for every workman and a general day wage scale of $4 and $4.50, with $5 and $5.50 for the more expert classes of labor.

(Special Correspondence).—It is reported that the Sedan claim, in which high-grade ore was found last week, has been sold for $45,000 and a large block of shares of stock in a company to be incorporated. W. P. Jenney consummated the deal with B. L. Smith, one of the owners of the claim. Mr. Garrett, another of the owners, has been retained as superintendent. A double-compartment shaft has been started, in which the rich vein was again encountered. The 12-ft. vein cut last week in the adit of the Manhattan-Nevada Gold Mines Co., at Central, is being developed. The adit is now in 125 ft., the face being gold-bearing lime-spar (calcite).——In the drift from the shaft on Lease No. 3 of the Manhattan Cowboy Mining Co., a four-foot vein has been encountered, assaying $25 per ton gold across the vein. This orebody is believed to be a continuation of the Union No. 9 vein, of the Manhattan Dexter Mining Co.——Free gold is being found in the adit on the Manhattan Mammoth Mining Co. at East Manhattan. The entire face is in ore that pans in free gold. A new vein has been discovered below the adit on the Mammoth and many specimens have been found.—— The Consolidated Manhattan Mining Co. is watching developments on this vein, as it is close to its line. A survey indicates that the vein will be cut in the Consolidated adit within 25 ft. It is 150 ft. long and the face is in milling ore.——Good ore has been encountered on the Manhattan Jumbo mine, northeast of East Manhattan. Elwood Maden, one of the owners, while prospecting, sank a shaft through the cap, and in a few feet found a good-sized vein which pans gold.——Several pieces of rich gold rock were brought into town yesterday by a prospector, who claimed to have found them on his property near Millett, 40 miles north of Manhattan. Several parties left for the scene of the alleged strike this morning. The camp of Millett came into existence last spring, and is near the site of several old silver mines which have been idle for years. Water and fuel are abundant.

Manhattan, August 4.

LYON COUNTY.

(Special Correspondence).—Ramsey, a new town, with a population of 200, is at the head of Morgan canyon on the north slope of Alamo mountain at an elevation of 5,350 ft. The camp is reached by stage from Churchill, on the Nevada & California railway, 15 miles by good road.—— Stage fare one way is $5. An automobile is run irregularly from Dayton, a distance of 25 miles. The camp dates from February, 1906, when the Ramsey brothers staked 150 claims. During April, 300 men covered the district with locations, though even up to the present there appears to have been no rich rock found. The site of the camp was shifted to its present place a mile north of the first Ramsey, owing to the discoveries made on May 24 by Mr. Clark, on the Gem claim. Clark made the best find to date on ground left vacant. This is called the Lucky Boy and is not over 750 ft. long. Although there are mountains of considerable height within two miles of the camp, the topography in the immediate vicinity is one of low relief. Several east-west gulches, from 200 to 300 yd. apart and separated by ridges not more than 75 ft. high, cut a north-south range of hills, the slope being toward the east. Paralleling these gulches is a system of veins with northerly dip. The richest vein has a northeast-southwest strike with numerous crossing veins. The country rock is eruptive and normally hard, but soft and highly colored near the lodes; it is rhyolite or andesite. Water is hauled into camp from some shallow wells and a spring, a mile from camp. The deepest development is a 40-ft. shaft on the Lucky Boy claim. Trenching to find the walls has been done on this claim. On no other claim did I see more than the perfunctory open-cut or shallow shaft. There are now 80 tents and 3 wooden buildings in town; the mercantile community comprising 3 stores, 2 restaurants, 8 saloons, 1 blacksmith shop, 1 assay office, 1 feed-yard, 1 recorder's office, 1 town-site office, and 2 lodging-houses in contemplation. Every man in camp is an optimist, and many are showing their faith by replacing tents with frame structures as fast as lumber arrives. With plenty of active prospectors on the ground, numerous veins, sufficient water, good roads, and some good ore, I believe that the elements of a permanent camp are in sight.

Ramsey, August 4.

STOREY COUNTY.

A 15-stamp mill is being built on the Comstock Lode at Gold Hill, by Utah people.

NEW MEXICO.

LINCOLN COUNTY.

Vandervoort & Wingfield have a lease on the Little Nell. ——Low & Jackson, lessees on the South Homestake, are taking out ore which is being crushed in the South mill.—— McIvers & Crary are getting a fair grade of copper-gold ore on their White Oaks group on the west side of the mountain. A deep shaft will be sunk on this property.——Sinking has been resumed on the Old Abe. Water was encountered at the 1,300-ft. level, a pump installed and sinking resumed. Arthur Greene is superintendent.——At the Hopeful mine at Parsons, owned by the Eagle Mining & Improvement Co. the 200-ton mill is in operation. The capacity of the mill will be increased to 1,000 tons of ore per day. J. M. Rice is president.

SOUTH DAKOTA.

PENNINGTON COUNTY.

The Montezuma Mining Co., one mile north of Rochford, is working 20 men, and has recently uncovered several new orebodies. A five-stamp mill has been erected for sampling and testing ore from the different workings. The object of the company at present is to open up the mine and to determine the best method of treating the ore.—— At the Golden West, on Castle creek, 10 men are employed and 50 tons of ore are treated daily. So far, all of the ore handled has been taken from the open cuts.—— New battery blocks are being set in at the Stand-by mill, which is undergoing renovation. Twelve men are blocking out ore, of which there is a large reserve. The mill has 40 stamps and will be running within 30 days. V. T. Price, of Rapid City, and J. B. Baker, of Lead, are interested.—— The Egyptian-Holy Terror mine at Keystone is working two shifts and the shaft is being sunk at a good rate. A contract has been let to Charles Hall for freighting 50 tons of ore per day from the Egyptian mine to the custom mill. At the Holy Terror no work has yet been done.—— Work has been temporarily suspended at the Dakota-Calumet, pending the completion of improvements. Grading is under way at the hoist for two new boilers, and a pump of large capacity has been ordered.

LAWRENCE COUNTY.

Negotiations which began in June for the reopening of the Clover Leaf mine, on Elk creek, have been temporarily suspended. It is expected that something will be done toward financing this property, and it is probable that work will soon be resumed.

UTAH.

SALT LAKE COUNTY.

The Montezuma Co., of Bingham, is shipping silver-lead ore to the United States Smelting, Refining & Mining Co.'s smelter. P. Porter says that the Montezuma will ship from now on at the rate of 150 tons per month ——Adjoining the Montezuma is the Centennial property, in which a drift is being driven to cut the orebody found on the upper portion of the property.

WASHINGTON.

OKANOGAN COUNTY.

A 25-h.p. gasoline engine, an air compressor and two Rand drills have been installed at the lower adit of the Mountain Sheep mine, which is now in 450 ft. At 225 ft. from the portal a vein of low-grade silver-lead ore was encountered, and the face of the adit is now in another vein

of high-grade ore which is known to be seven feet thick.——The shaft of the Copper World mine is down 70 ft. in ore that carries 20% copper and about $2 per ton gold. The Dominion Copper Co. has bid to smelt this ore free of charge and allow $1.40 per ton as a bonus. It carries a large excess of iron and also sulphur.——Work has been resumed on the Butcher Boy mine since the bond on it expired. Five men are employed sinking and taking out rich ore.——The Bluffton Gold & Copper Mining & Smelting Co., owning several claims, including a part of the Bolster townsite, near Chesaw, is planning extensive operations. The principal work is on the Bluffton shaft and adits. A body of ore was encountered in the shaft, which was afterward developed in an adit 218 ft. long, at a depth of 150 ft. The face of the drift is in ore that runs $18 per ton in gold and copper.——The Mad River, Bluffton, Copper Mountain, Olentangy and several other companies are combining to install an electric plant to supply the towns of Bolster and Chesaw, and the mines near by, with light and power.——The Bluffton people have started a new adit to run 1,800 ft., which is calculated to strike the Bluffton vein at a depth of 1,200 ft., and a compressor is to be installed.——The Q. S. tunnel was driven 1,000 ft. when work on it was suspended until the appointment of a new superintendent. Several new claims have been added to the Q. S. group.—— F. Moritz has bonded five claims on the north of the Q. S. group. He has also bonded the Germania group of six claims on the south of the Q. S.——The face of the adit, at the Triune mine, on Palmer mountain, is again in ore.——At the Horn Silver mine, on Palmer mountain, several tons of ore have been sacked that is rich in native silver.

Republic, July 25.

STEVENS COUNTY.

(Special Correspondence).—Rich ore is being taken from the Dominion Hill Mining Co.'s property, near Addy, Wash., 73 miles north of Spokane. The vein carries high-grade gold, copper and silver ore. It is announced that ore will be sent to the Granby smelter the last week in July.

Spokane, July 23.

(Special Correspondence).—A 500-ton concentrating mill will be built in Metalline district by Louis Larsen, who has had ground adjacent to the Mammoth mine surveyed for that purpose. He expects to begin the construction of the plant in September.——The Mammoth Mining Co. is working two shifts in its main adit 22 ft. from the portal, on a vein of high-grade silver-lead ore. On the opposite side of the hill another vein has been discovered which is being stripped.——The Morning Mining Co. has purchased 20 more claims adjacent to its own property.——At the First Thought mine the output will be doubled as soon as the aerial tramway is completed. A hoisting plant has been ordered.——Ore has been discovered in the shaft at a depth of 65 ft., which is being shipped to the smelter.——The Stirling mine, in Metalline district, employs 10 men and is getting out ore.——The Dominion Hill Co. is shipping to the Granby smelter, at Grand Forks, B. C. On the adit-level ore is coming in at the face of the drift on the vein, the best of which assays 24 oz. gold and 140 oz. silver per ton. Some of the ore taken from the mine lately assays as high as $1,200 per ton.——A shaft has been sunk 40 ft. in low-grade ore on the Iron Horse mine, and a company is about to purchase this Cedar Canyon property on account of the large excess of iron in the ore, in addition to the gold and copper content.——The Providence mine, in Cedar Canyon district, under lease, has shipped two carloads of silver-lead ore that averaged $100 per ton. The ore also contains some copper. There are three veins on the property, two adits having been driven on one of them, one of which is in 552 ft. and heading for No. 3 vein. The Providence Co. expects to install a mill as soon as railway transportation for the concentrate is available.——A large body of gold-copper ore has been encountered in the Butte and Chief mine, near Orient. The Tacoma & Kansas City Mining Co. is about starting work on the Tiger claim where there is a large vein of low-grade silver-lead ore, which carries a little gold J. A. Frost of Tacoma, Wash., is president of this company.——A pumping plant has been installed at the Bonanza and the mine is being unwatered

Myers Falls, July 28.

WYOMING.

ALBANY COUNTY.

A. A. Golder, of Boston, agent for the Strong Copper Mining Co., of Laramie, and C. P. Russ, of Haverhill, Mass., who have been at the Strong mine, have decided to build a reduction plant for that property. The Strong shaft has reached the 300-ft. level, developing a body of copper ore. The mine is 14 miles east of Laramie and is owned largely by local men.

LARAMIE COUNTY.

M. G. Grovenor, of Salt Lake, has transferred to the Wyoming Gold & Copper Mining Co., for $125,000, the Last Chance, Ready Cash and Grovenor copper claims in the northern part of this county.

CANADA.

BRITISH COLUMBIA.

During July the Dominion Copper Co. smelted 18,000 tons of ore producing 404 tons of matte carrying 44.6% copper, which, with gold and silver gave a gross output for the month of $86,000.——The Great Northern engineers have completed surveying the line to the Pathfinder, and are now at Phoenix to complete some Great Northern surveys in that district.——It is reported that the B. C. Copper is making good headway in developing the Oro Denoro in Summit camp.

At the Ymir mine, during June, 25 stamps crushed 1,500 tons of ore, producing 286 oz. bullion valued at $3,400 and 150 tons of concentrate valued at $3,600, making a total of $7,000 for the month. This was the first month of production since the shutdown. All the ore was extracted in the course of development from all parts of the mine.——The ore shipments for the week ending August 4 from Rossland were: Centre Star, 1,860 tons; Le Roi, 2,970 tons; Le Roi No. 2, 420 tons; Le Roi No. 2 (milled), 1,200 tons; White Bear, 60 tons; total for the week, 6,510 tons; and for the year, 190,229 tons.——At the Trail smelter for the week 6,244 tons of ore were received. Besides ore from Rossland, shipments were received as follows: Iron Mask, Kamloops, 237 tons; North Star, East Kootenay, 139 tons; Providence, Greenwood, 50 tons; St. Eugene, Moyie, 21 tons.——For the first time in two years and a half the Snowshoe is on the shipping list. Following are the tonnage figures for the week ending August 4: To Granby smelter from Granby mines, 15,649 tons; from Emma, 230 tons; to Dominion Copper Co.'s smelter from Brooklyn-Stemwinder, 2,508 tons; from Rawhide, 528 tons; from Sunset, 825 tons; from Mountain Rose, 40 tons; to Nelson smelter from Emma, 100 tons; to Trail smelter from Snowshoe, 125 tons; from Providence, 30 tons; total shipments for the week, 20,035 tons; total shipments for the year, 723,755 tons. The Boundary smelters treated: Granby smelter, 16,400 tons; Dominion Copper Co.'s smelter, 3,901 tons; total for the week, 20,301 tons; total treatment for year to date, 728,350 tons.

NOVA SCOTIA.

The Allan shafts of the Acadia Coal Co., near Stetlarton. are all being lined with concrete, which not only assures safety from caving, but prevents leakage of surface water into the shafts. H. E. Coll has charge of the work. The two shafts are 1,400 ft. deep.

ONTARIO.

The discovery of sphaerocobaltite, the protocarbonate of cobalt, at Cobalt, is announced. It has only mineralogical significance.

MEXICO.

For some time miners employed in the Esperanza gold mines in El Oro district have been stealing ore, some of which is worth $15 to $25 per lb. Recently the authorities decided to make an example of the thieves. Ten men of the night shift were found with ore in their possession when leaving the mine in the morning, and were placed under arrest. The men were lined up near the mine entrance, a detachment of soldiers was called out and the men were shot within 15 minutes after being taken into custody. The bodies were then allowed to remain where they fell during the entire day, as a warning to other ore thieves.

Personal.

L. S. AUSTIN is at Berkeley.

WILLIAM H. HOWARD is at Denver.

H. G. SCOTT is visiting London from Siam.

THEO. F. VAN WAGENEN is at Zacatecas, Mexico.

G. P. ASHMORE was married at London on August 16.

CLAUDE V. HAINES is on a visit to England from India.

LLEWELLYN HUMPHREYS has an office in Salt Lake City.

ROBERT C. SYSON is on his way to California from London.

EDWARD HOOPER has been examining copper mines in Sweden.

A. J. BENSUSAN is manager of the Ouro Preto gold mines, in Brazil.

THOMAS J. JONES has returned to San Francisco from Salt Lake City.

ALEX. MACKEY is manager of the Eagle Co.'s mines at Parsons, New Mexico.

JAMES COLQUHOUN, president of the Arizona Copper Co., is at Monterey, California.

ANGUS MARSHALL is manager of the Eureka Mining Co.'s plant near Wallace, Idaho.

A. SYDNEY ADDITON is at Dawson; he is expected in San Francisco next month.

W. M. SPAULDING, of Buffalo, has been a visitor in the San Juan country, Colorado.

ARTHUR GREENE is superintendent of the Old Abe mine, at White Oaks, New Mexico.

C. COLCOCK JONES is examining mines in eastern San Bernardino county, California.

EDWIN H. MESSITER, engineer with the Robins Conveying Belt Co., is in San Francisco.

S. HERBERT WILLIAMS, of Boston, is visiting the mines of Ely and Tonopah, in Nevada.

REEVES DAVIS has returned to Oakland, Cal., from a trip through mines in western Nevada.

E. H. HAMILTON is general superintendent of the Arizona Smelting Co. at Humboldt, Arizona.

C. H. SPINKS is superintendent of the American Magnesite Co., at Livermore, California.

EDWIN E. CHASE has returned to Denver from a professional trip to Wyoming and Montana.

HOWARD D. SMITH has returned to San Francisco from examining mines in Sierra county, California.

F. M. SIMONDS and E. Z. BURNS have returned to New York from examining mines in Guerrero, Mexico.

CHAS. A. SHORT is manager of the property of the Jenny Gold Mining Co., at Goldsprings, in western Utah.

H. DEC. RICHARDS has returned to San Francisco from New York; he will proceed shortly to Alaska.

E. H. JOHNSON has been elected president of the South African Chemical, Metallurgical & Mining Society.

D. E. BIGELOW is now at Melbourne; he is chief of the engineering department of Bewick, Moreing & Co. in Australia.

EDGAR NEWHOUSE, of New York, is making an official visit to the smelters of the American Smelting & Refining Company.

T. H. SCOTT has returned to Morenci, Ariz., after an extended trip through the mining regions of Sonora, Mexico and southern Arizona.

N. F. LEOPOLD, of Chicago, has been inspecting copper mines in the Burro mountains of New Mexico, near Silver City, in which he is interested.

J. H. G. WOLF has been appointed chief engineer for the Tonopah Exploration Co. in the installation of water, power, and mills at Manhattan, Nevada.

HENRY M. HOWE and BRADLEY STOUGHTON have formed a partnership for consulting practice in metallurgy, with offices at 27 West 73rd St., New York

Obituary.

R. W. GRISWOLD, a mining operator, died July 30 at Colorado Springs of acute pneumonia. He was 32 years of age.

ERNEST W. HENKLEMAN died at his home at Columbia, Cal., last week. He had been a miner in that district for 50 years, was a native of Germany and 80 years of age.

JAMES MCKINTY, who two years ago was appointed superintendent of the Consolidated Virginia and California mines, at Virginia City, Nev., died July 26 at his home in Virginia City, aged 58 years.

ERNEST H. WEBSTER died a few days since of typhoid fever at the City of Mexico. He had been employed at the mines of the Perico Mining & Exploration Co., at Jilotlan de los Dolores, State of Jalisco.

Trade Treatises.

THE FALKENAU ASSAYING CO. is permanently established in its large, new laboratories at 918 Washington St., Oakland, Cal. Its present quarters are superior to those formerly occupied at 538 Sacramento St., San Francisco.

The Procter & Gamble Co. has just purchased of the ATLAS ENGINE WORKS, Indianapolis, Ind., 4,000 h.p. of Atlas Water Tube Boilers, which are to form the boiler equipment of this company's new plant at Staten Island, N. Y. It is intended to make this one of the model factories of the world.

Dividends.

THE BUNKER HILL & SULLIVAN MINING & CONCENTRATING CO., on August 6, paid dividend No. 107, of $180,000, making the total paid since January 1, 1906, $1,440,000, and total to date $6,966,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco, August 8.

Ophir	$3.40	Tonopah Ex	$5.56
Savage	0.81	Belmont	5.30
Standard Con	2.00	Midway	2.23
Eureka Con	8.50	Montana	2.80
Con. Virginia	0.87	Mohawk	2.05
Tonopah	18.15	Jim Butler	1.46

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 2. £ s. d.	August 9. £ s. d.
Camp Bird	1 4 3	1 4 6
El Oro	1 11 0 ex. div.	1 10 0
Esperanza	3 11 0 ex. div.	3 1 6
Dolores	1 18 9	2 1 3
Oroville Dredging	0 17 0	0 16 3
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 4 4½	1 3 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 2.	Average Prices for Week Ending August 9.
Copper—Lake (cents per lb)	18.55 @18.70	18.62½@18.75
" Electrolytic "	18.20 @18.35	18.28 @18.37½
" Casting "	18.00 @18.00⅛	18.00 @18.00⅛
Lead "	5.75	5.75
Spelter "	6.03	6.02½
Silver (cents per oz.)	0.65⅜	0.65⅛

CURB QUOTATIONS—NEW YORK.

	Prices for August 2.	Prices for August 9.
Bingham Central	2⅛	2⅛
Boston Copper	26⅜	25⅞
Calumet & Arizona	16½	16½
Cumberland Ely	7¼	7⅜
Dolores	9¾	9⅜
El Rayo	..	4⅞
Guanajuato Con	5½	5¼
Giroux Con	7½	7½
Greene Con	23⅞	25
Nevada Con	18½	18⅛
Nipissing	5⅜	5⅝
Tennessee Copper	40	46
Tonopah Ex.	5⅝	5⅜
Tonopah-Belmont	5	4.90
Tonopah	19¾	18⅜
United Copper	64	63
Utah Copper	27½	27½

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

THE great inequalities of the earth's surface are the result of unequal radial descent of the surface due to contraction brought about by cooling. Mountains represent portions of the exterior where it has been thickened by abundant sediment and then exposed to lateral crushing with proportionate upswelling.

THE noted copper ore deposits of Copper Basin, Ariz., are 11 miles southwest of Prescott. These deposits are the result of the oxidation of cupriferous pyrite occurring in granite and porphyry, and the impregnation of the local gravel deposits overlying the granite with copper carbonate, deposited from solution.

IN PLACES far from railroads, where materials have to be transported over difficult and dangerous trails, tanks may be made by constructing cemented basins in the ground. This may necessitate pumping, but, as pumps are necessary in any event around cyanide plants, the cemented tank affords one way out of a difficulty.

QUICKSILVER has never been found in large quantity in Siberia, although traces of it exist in many parts, as, for instance, near Minousinsk, also in the Nerchinsk district and along the shores of the Okhotsk sea. No deposits are worked, the Russian quicksilver coming from the Auerbach mines, of the Ekaterinoslaf government in southern Russia.

THE contributions that are supplied to moraines by glaciers themselves, from the abrasion of the rocks over which their ice passes, are minute compared to the accumulations which are furnished from other sources. These great rubbish heaps are formed almost entirely from debris which falls or is washed down the flanks of mountains, or from cliffs bordering the glaciers.

AN AUTHORITY on cyaniding gold and silver ore says that the acidity of ore may be neutralized by the simple washing with water to remove soluble salts, or washing with lime-water or caustic soda, with preliminary and subsequent water washes, in more obstinate cases. The most simple method is by intimately mixing the necessary amount of lime with the ore and soaking with a sufficient amount of water.

ORE containing antimony is usually difficult to cyanide. Such ore will probably give better results after roasting, but this must be carefully done, for with the volatilization of the antimony (or arsenic) there is always some loss of gold. Antimony, however, passes off at a relatively low heat, and after that mineral, or its compounds, has been volatilized, the heat may be raised to bring the other sulphides to a 'dead roast,' in order that no soluble sulphates may be formed, which would result in a strongly acid solution, that would have to be neutralized.

ORDINARILY we give no attention to communications requesting information when the writer fails to give his name and post-office address; but the careless miner, at Searchlight, Nev., who signs his letter 'A Subscriber,' is evidently careless about other things as well, and apparently contemplates self-destruction in attempting to make an electrical device for firing blasts. Machines are made for the express purpose of firing blasts by electricity, and manufacturers make primers that are perfectly safe to handle, only requiring to be attached to the wires connecting with the firing machine. These devices are advertised in the columns of the MINING AND SCIENTIFIC PRESS, as Mr. Subscriber could readily ascertain. It would be extremely dangerous for anyone to attempt to rig up an impromptu blasting-machine by means of dry batteries and 'home-made' primers. Never, under any circumstances, insert a wire, pin, or other instrument, into a cap intended for exploding dynamite, and commonly known among miners as 'giant-caps.' The material contained in these caps is mercury fulminate, an explosive of high power and extremely sensitive to shock, abrasion, electric spark or fire. While the dynamite, even No. 1, is comparatively safe, the detonators are very dangerous, and their misuse is probably responsible for the greater number of accidental explosions of nitro-powder.

THE placer mining query submitted by the Waldo, Ore., correspondent is interesting and unusual. The proposition to drive a drift through bedrock from a point on the canyon side and somewhat lower than the apparent bottom of the channel exposed on the face of the cliff, is all right, but the grade suggested—four per cent—may prove too light and four and one-half to five per cent is better where available, as it undoubtedly is, in this instance. The character of the gravel to be washed is probably unknown and can only be judged by what is seen upon the surface, and this may be misleading. The bedrock adit must therefore be started sufficiently low to admit of at least four and one-half per cent grade, and to be sure to strike as low as the lowest stratum of gravel when it reaches the channel, or better still, be a little below it. Apparently the grade of the channel, on bedrock, is not over 200 ft. per mile, as bedrock 400 ft. deep at the dam runs out at the surface in a distance of two miles, which is a little less than four per cent. If the proposed adit, to be driven through bedrock to the channel above the land-slide, is properly planned, the rest seems easy. It might be as well to sink as to raise through the gravel owing to danger from runs, which may be expected to occur should the gravel be saturated with water, as it probably is. When the raise is completed and the sluice has been properly placed in the adit, mining may be commenced by sluicing into the shaft, the surface gravel around its mouth to be carried over the riffles in the sluice discharging into the canyon at the mouth of the adit. Care must be constantly taken to prevent caving of the bank, as such occurrence might prove disastrous. In time a funnel-shaped pit will have been formed reaching from the surface to the level of the adit. Still proceeding carefully, to avoid the caving of greater masses of gravel than the entrance to the adit in the pit, or the sluice itself, can accommodate, the magnitude of operations can gradually be increased when a sufficient area has been denuded to bedrock about the upper end of the adit. When there is no further danger of choking the sluice, or entrance to the adit, mining may be carried on by hydraulic method, to the maximum permissible under the conditions then existing. The only real mining problem involved is in making connection between the upper end of the adit and the surface through 400 ft. of gravel of which nothing is known. If it is light, small, wet, and easily washed there would be trouble in raising and there might be also in sinking, but the latter method affords better means of control. The connection should, in our opinion, be made by sinking and substantially cribbing the shaft from top to bottom, as a collapse of the shaft at any time before the funnel-shaped pit has been formed might necessitate the extension of the adit and the sinking of a new shaft. While the surface pit is forming, the upper timbers of the shaft may be removed as fast as they are reached in the course of mining operations.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Unrest in Mexico.

The Editor:

Sir—The recent trouble with the Mexicans at Cananea has attracted a great deal of attention from the American press to the general trend of border affairs. Since then much has been written of strikes and menacing revolutions, with threats to drive Americans from the country. To the Americans in Mexico, and those along the border, this is all too familiar. The press reports have been strangely accurate, and have caused much anxiety for the personal safety of Americans in Mexico and the financial security of their interests.

To those of us in the midst of it, these recent outbreaks are merely croppings of a long existing and steadily growing feeling of unrest and dissatisfaction among the Mexicans. And it is largely natural. When has there been a time of more than a few years when Mexicans were satisfied? A people of volatile temperament, their kinetoscopic government a playground for nearly a century for liberators, emperors and presidents, it ought to be easy to read the signs of the present alarm. Mexico is going to have another revolution; the date of it depends on how soon they can find a strong man ambitious and foolish enough to tackle it. The fact that they have revolutionary headquarters at St. Louis, Mo., and are spreading circulars inciting trouble, and unearthing old grievances and old war cries of "Mexico for Mexicans," and that the Western Federation of Miners is reported to have helped in this stirring up, are merely natural sideshows of a popular-price melodrama.

Of course, all this is serious enough to Americans in Mexico, and to the safety of their interests, but I don't think it is an anti-American outbreak any more than it is against Diaz and his government; against Terrazas and his ill-gotten wealth, and anti-everthing that the *peon* class in Mexico hasn't a hand in and never can have.

Porfirio Diaz has governed Mexico well—considering Mexico. His government has been satisfactory to most of the better class of Mexicans, because it is partial to them; to the American, because it is stable and protects his interests; and to himself and friends, because it pays well. Besides, he has bettered the condition of the *peon* class. He has encouraged education among them, and fostered their interests as much as possible. Certainly, no Mexican has appeared who could improve on his work as a whole, and the life and death problem just now, on this side of the Rio Grande is to find someone who can carry it on as well.

There is a certain amount of jealousy among the better class of Mexicans toward the American business man and miner in this country. They resent the competition with Yankee enterprise. The necessity to rustle to beat it, goads them. It isn't Mexican. While we have taught them to make money, we have taught them to spend it. We have been good teachers and they adept scholars. Since they have tasted the luxuries their money can buy, it has gone rapidly, and the newly poor are apt to be disgruntled. They are jealous and envious of our success, and resent the passing of the mineral wealth of their country into the hands of foreigners—hence "Mexico for Mexicans."

The Mexican *peon* is better off now than he ever has been, and were he left alone and properly managed, he would be contented. But he has been told that he ought to get as much wages as the American, that the company commissary is robbing him. Mexican labor must be handled by skilled hands, and entirely differently from the labor of the States. His wages depend upon his earning power up to the cost of his living, and above that on his popularity as a host, the size of his family, and the number of his friends—in short, the eating and drinking capacity of his house. His aim in life is a living, and his efficiency as a laborer depends upon his getting little more than that. If a district demands high wages, it also calls for high prices in the commissary. The *peon* can't stand prosperity. The possession of *cinco pesos* so demoralizes him that he is physically and mentally unable to work.

The *peon* may be incited into revolt and stirred against the American until he strikes the blow, and so fight out his patriotism. He will gain little. Even the chance of the immediate success of the present movement is very remote. Diaz is firmly intrenched behind an army that is loyal and strong, and from the popularity of bullfights, apparently well-enough fed. Ultimately the *peon* is worse off for his revolution, because his failure will most certainly be punished, and his property, if perchance he has any, confiscated to the loyal friends of the Government.

To us there is another consideration more vital than the *peon's* welfare—our own. Success or failure to him means the same immediate danger to the American while it is going on. In most camps the American has little chance. Outnumbered hundreds to one, he cannot protect himself, and, so far from relief, he cannot escape. He cannot call for aid from the United States. Distances are too great, camps too isolated, and railroads too few. Brooding over grievances, real or imaginary, against the Gringo, safe from apprehension, the Mexican's temptation to shoot is great and the running good.

But the Mexican won't bring down the wrath of Uncle Sam too hastily. History has taught him a lesson. Of the American he is unafraid, but he lives in mortal fear, and highest admiration for the Texan. Most Mexicans believe that if Texas were out of the way, they could invade and capture the United States easily.

I believe that the United States will eventually have to use force to protect its citizens, capital, and interests in Mexico, but the task is an enormous one—another 'negro problem,' more Philippines, another addition to the white man's burden—and as long as we have a Diaz to shoulder the work for us, let us watch and learn how. Our troubles will come soon enough.

A GRINGO.

El Paso, July 26, 1906.

Too Perfect for Use.

The Editor:

Sir—There have been several articles in the MINING AND SCIENTIFIC PRESS recently, dwelling upon the merits and requirements of a good foreman, and the last one, an extract from a pamphlet entitled 'The Business of Contracting,' reminds me of a parrot story.

During the eventful days of last April, a lady was seen carrying, among a numerous array of bundles, a poll-parrot. She was making her way toward the ferry building, and the parrot, who had evidently passed through a strenuous period, was occasionally giving vent to his feelings in expletives most profane, to the great mortification of his mistress, who would reprimand polly with "Hush up polly; shut up, etc.," until polly, thinking, perhaps, of more dangers to come, was overheard to remark: "Oh, damn it, this is the limit."

Now, Mr. Editor, some of the previous articles on the foreman have been very good, in fact enough was said on what he should be, but this last one must be a perfect

paragon, a blending of angel and tyrant, a philosopher and diplomat, he must take his whisky alone. Of course, he must have begun at the bottom to know a day's work; he must have passed the chairs, so to speak. It is a foregone conclusion that such a man would not remain a foreman. He would rise. Why? Because there is more pay higher up, with generally, less knowledge of the business required than the foreman possesses. Ten to one that the foreman is only receiving a salary of fifty cents or, in rare cases, one dollar per day more than the men he bosses, yet, according to the pamphlet quoted, he is the man who makes the money for the firm. Then why should not he be paid a salary adequate to his services? No wonder such foreman are scarce as hens' teeth.

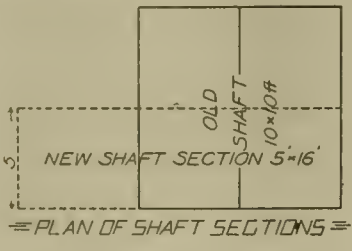
The best foreman of a mine I ever knew was illiterate, not much of a worker himself, yet he knew how; he would hob-nob and drink with anyone, and get drunk too; but he could handle men, and distribute labor to advantage, he was very successful as a foreman, and held his job under the late Alvinza Hayward for many years.

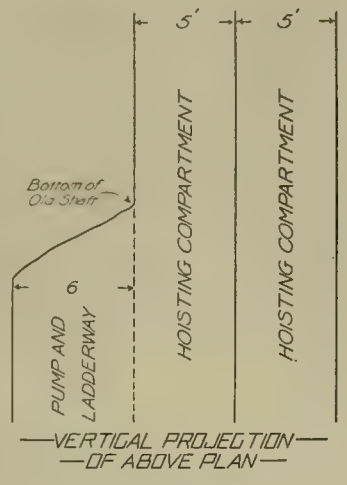
I have worked under many foremen good and bad, which convinces me that a man for his proper calling is born and not made. But the one that is required in the article quoted above, and to call him Mr. too, bah! let me shake hands with polly.

MINER.

Oakland, July 30, 1906.

CALCIUM-SULPHIDE is known to occur in nature only in meteorites, in the form of pale brown globular inclusions.



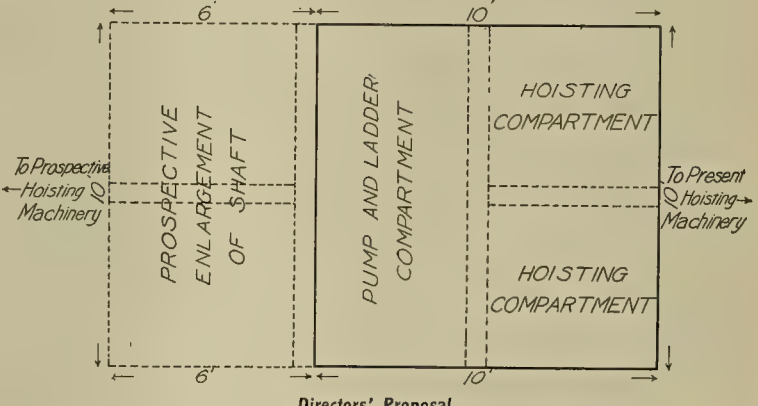


Manager's Proposal.

The Best Shape for a Shaft.—I.

The Editor:

Sir—Within the past half year there has been carried on through these columns an interesting discussion on the 'Best Shape for a Shaft.' The discussion arose over the problem presented by R. H. Burrows, of Guanajuato, in the issue of Feb. 24, and which may be briefly stated as follows: It having been proposed at a mine near Guanajuato to sink a shaft to a depth of 2,300 ft., the question arose as to the availability of an old Mexican shaft 10 by 10 ft. which had been sunk to a depth of 320 ft. years previously. It was anticipated that it would, in time, become necessary to hoist through the proposed shaft, at least 1,000 tons of ore daily, and the possibility of encountering a large volume of water in the deep shaft was also to be considered. This suggested a shaft of liberal dimensions, but as the manager and directors of the company did not wholly agree upon the 'Best Shape for the Shaft,' the question was submitted to the readers of the MINING AND SCIENTIFIC PRESS, with a request for their opinions. This appeal resulted in numerous suggestions being offered by practical and experienced mining engineers. A resume of the opinions of these contributors is of value. The manager of the Mexican mine in question was of the opinion that for the stated requirements a three-compartment shaft 5 by 16 ft. would be sufficiently large, admitting of two hoisting compartments, each 4 by 5 ft. with a pump and ladder-way 5 by 5 ft. The walls being hard and firm would permit dispensing with wall-plates, thus economizing timbers which are expensive in that district. This scheme also contemplated saving the excavation of two feet of rock otherwise necessary to make room for the wall-plates. The manager proposed to make use of the old 10 by 10 ft. Mexican shaft by dividing it into two compartments, allowing a space 6 by 10 ft. for two hoisting compartments, leaving a space 4 by 10 ft. for pump and ladder-way. At the bottom of the old shaft, however, it was proposed to change the form from 10 by 10 ft. to 5 by 16 ft., cutting a jog at the bottom of the old shaft, and curving the pipes, etc., to pass from one of the compartments in the 10-ft. square portion to the enlargement, below 320 ft. in the new portion. When submitted to the directors, the plan of the manager was opposed by them with vigor, but they were not without a substitute, and suggested that the better scheme would be to carry down the shaft as originally cut by the Mexicans, or perhaps it might be improved by making it 10 by 11 ft. They claimed: (1.) It would cost little more to sink a shaft 10 by 10 ft. than it would one 5 by 16 ft.; (2.) A deeper cut might be made in the 10 by 10 ft.-shaft than in one 5 by 16 ft.; (3.) The shattering of the sides of the shaft would be much greater, or the



Directors' Proposal.

number of short holes required to square up after each round would be more in a shaft 5 by 16 ft. than in one 10 by 10 ft.; (4.) A shaft 10 by 10 ft. would give the same number of hoisting compartments and a larger compartment for pump and ladder-way, and general pipe and electric wire purposes; (5.) In view of the possibility and probability of a later necessity for a large hoisting capacity—larger than possible or advisable for two hoisting compartments—the enlargement of the 10 by 10 shaft to a 10 by 16 ft. shaft, which is shown in the accompanying sketch, would give four hoisting compartments, and one pump compartment in the centre, and could be accomplished more quickly and cheaply than by sinking another hoisting compartment 5 by 6 feet.

The proposition at once attracted the attention of engineers and the problem was discussed at length in all its phases during several succeeding weeks.

It was shown by W. H. Storms that a shaft 5 by 16 ft. was sufficiently large to permit the hoisting of the maximum amount of rock that would probably be required—1,000 tons per day. The same writer called attention to the fact that in the proposition to make the shaft 10 by 16 ft. no provision for guides, pump column, etc., had been made, without which the operation of the mine on the scale contemplated would be impossible. He also showed that the 10 by 10 ft. shaft could be divided by steel I-beams into four compartments of equal size, three of them being fitted with guides for either cages or automatic dumping skips. The proposal to make an offset in the shaft at 320 ft. was opposed by Mr. Storms and by nearly every other contributor to the discussion, as impracticable.

D'Arcy Weatherbe showed that when the old Mexican shaft had been divided into two hoisting compartments and a long, narrow pump compartment, and these had been properly timbered, there would not be left sufficient room to handle the large tonnage desired. He suggested first cutting the shaft 18 ft. 4 in. by 6 ft., providing three hoisting compartments, each 5 by 6 ft. and leaving a compartment 3 ft. 2 in. by 10 ft., representing that part of the Mexican shaft outside of the straight line of three hoisting compartments. Mr. Weatherbe submitted an alternative proposition to enlarge the shaft to 21 by 6 ft., making three hoisting compartments 5 by 6 ft. in a straight line, with a pump and ladder-way compartment at one end 2 ft. 8 in. by 6 ft. clear. Both of these schemes contemplated the use of 10-in. dividers throughout, but, owing to the high cost of timber and the desire on the part of the management of the mine to economize, provided for no wall-plates, which omission seems to weaken an otherwise practical idea. He says, however, that "It is hard to conceive of a shaft of such a depth and producing such a daily amount of ore to be constructed without properly framed sets."

H. R. Plate, in discussing the proposition, dealt more with the mining features, assuming that the shaft was to be sunk with machine drills. He contended that it would be more convenient and expeditious to work on horizontal shaft bars in a shaft 5 by 16 ft. than in one 10 ft. square. He also called attention to the necessity for a substantial timber frame, and argued that it would prove false economy to omit timbers. The difference in cross-section between a shaft 10 by 10 ft. and one 5 by 16 ft. is considerable—20 sq. ft.—and this in 2,000 ft. of sinking would make a total difference of 40,000 cu. ft., or over 3,000 tons more of rock which must be shoveled and hoisted in the 10 by 10 ft. than in the 5 by 16 ft. shaft. To this Mr. Plate also calls forcible attention.

Thos. H. Leggett considered that a shaft 5 by 16 ft. was best suited to the requirements of this particular case, and characterizes the suggestion made by Mr. Storms that the shaft might be continued as started 10 by 10 ft. as "a very practical but perhaps costly method of utilizing the old shaft." Mr. Storms favored the 5 by 16 ft. shaft, and only suggested that the shaft might be sunk 10 by 10 ft. employing steel I-beams instead of timbers. This scheme, however, was not recommended. Mr. Leggett is also of the opinion that the 10 by 16 ft. shaft was out of the question, as unnecessarily large and expensive. He also said that through two properly equipped hoisting compartments much more than 1,000 tons may be hoisted daily from a depth of 2,300 ft. Mr. Leggett also properly says, the difference in the amount of ground that may be broken in a square or rectangular shaft of large dimensions is unimportant. He also considers that steel I-beams four inches broad on the flanges would be an amply strong frame as a substitute for timbers. He concludes by saying, "I much prefer a compartment 5 by 6 ft. to that of 4 by 5 ft. for deep shafts, though I have no doubt the latter can be made to answer all requirements."

John A. Church says that timbering in a large, deep shaft is indispensable, and that "the shape of the shaft cannot affect the size of timbers used, which will be determined by the weights and speed of hoisting." He also says: "The effort to reduce costs by cutting out some of the timbers—the wall-plates—does not seem practicable. * * * * Especially must the timbers that carry the guides be well braced, and also supported by posts. Otherwise they are likely to be torn out by the swiftly passing cage. * * * * I doubt if any system of timbering which omits wall-plates can be considered trustworthy in a shaft of the depth and output given in this case. * * * * It is evident that the question of timbering is the most important of those brought up except, perhaps, the limitations of a shaft for such heavy work to three compartments."

August 2, 1906. W. H. STORMS.

URANIUM IN AUSTRALIA.—A find of carnotite is reported from Olary, on the Broken Hill railway line, 257 miles from Adelaide, South Australia. The ore is said to occur as yellow incrustations and disseminated powder on faces and cavities in the lode, which consists chiefly of magnetic iron oxide, with black mica and quartz. The main lode is traceable for about 200 yd., either continuously or in isolated exposures, and as scattered float. A smaller similar parallel lode accompanies it on the eastern side at a distance varying from 5 to 15 yd. Traces of ore occur at intervals along both lodes, but are more freely developed along some 50 ft. of the more solid and continuous portion, which varies in thickness from two to three and one-half feet. The specimens brought to Adelaide were obtained by breaking portions of the lode which outcrops above the surface.

IT is beginning to be recognized that industrial warfare is no better a regulator of business than private warfare is of social intercourse, and it is this feeling that has led to the organization of labor on the one hand and to the organization of capital on the other, labor seeking to reduce its hours and increase its earnings, and capital, which is crystallized labor, striving to prevent the dissipation of that which it has so laboriously gathered. Each is wrong in its aims when it seeks exclusive domination; both will be right when they learn that they are forces which must work in harmony to carry out the ancient command to subdue and replenish the earth. Strikes and trusts are the clumsy attempts of the giants, Labor and Capital, to carve out each a world on which he shall be sole lord. Co-operation will be the form in which they will work together when they realize, as they are coming to do, that as enemies they can only harm each other while as allies they are masters of the world.

Copper at Butte, Montana.

Written for the Mining and Scientific Press
By Arthur H. Halloran.

During 1905 nearly one-quarter of the world's total copper production came from Butte. The cessation of its output would seriously cripple industry, but such stoppage is fortunately not among the probabilities; on the contrary, copper in this district is now being found in ever-widening zones, where its existence heretofore was questionable. In depth it has been proved to 2,400 ft. in the Anaconda. To the north, North Butte's recent phenomenal production but points the way for further research. And toward the east, numerous new companies are now inviting public attention and capital. The three dimensions of length, breadth and depth are thus defined. And even skyward, the copper is traceable in smelter smoke.

This smoke is the bane of the real estate dealer. As a gray pall it hovers over the hills and gulches of the town, effectually shutting out the sunshine. Mountain and flat are barren and desolate; but little vegetation remains to suggest the picturesque appearance of the first settlement, seven miles from the present site of Butte City, at Silver Bow "upon a bend of the stream which forms a perfect figure of a gracefully curved Indian bow, and from the mountain peaks which surround the valley, the glistening waters of the 'silver bow' etched in a shimmering sheen upon a background of furzy grass form a striking feature of the landscape." Even the grass has disappeared; a prospector's burro would starve on the rough, barren hillsides; the trees originally there, are now rotting in the mines; all future growth is prohibited by this blasting breath of sulphurous fume. Yet even the smoke can scarcely be said to be a blemish upon this inspiriting scene, for it bears continuous testimony to useful metallurgical activity. Close to the divide from which the waters run to the Pacific and Atlantic, the elevation of 5,500 ft. affords the pleasant climate and beautiful scenery characteristic of a mountainous region. For the enterprising American it holds that most seductive attraction, money, in the form of the metal copper. The probable increase of this commodity is caused by a series of events, commencing with the success of North Butte and apparently culminating in the formation of the Butte Coalition. The two extremes in this series are themselves directly opposed in effect. For the success of North Butte has encouraged the formation of numerous new mining companies fringing the united claims of Butte Coalition. It is by these alone that Butte is insured from becoming a 'one-company camp,' terrifying to the miner in its prospect of reduced wage and privilege. Now that Mr. Heinze has buried the hatchet, these new companies are in the market, either competitors of Amalgamated or ready to be bought up. But today the Amalgamated is Butte and Butte is the Amalgamated. Tomorrow, as ever, is problematical. A letter from Mr. John Gillie, general superintendent of the Anaconda Copper Mining Company, gives an entrance to all the Heinze properties. The Montana Ore Purchasing Company is moribund. The Heinze-Amalgamated copper war is finished, bruises are rapidly being healed and expert witnesses are seeking new fields of unrest.

This, then, leaves two factions, broadly distinguished, not only personally, but also geographically. For the new companies, with but few exceptions, are now prospecting in what was formerly declared worthless ground, lying to the north and east of the big copper producers. The ground in which they are working has received but little attention from the geologist. Naturally every attempt is made to connect veins cropping across the 'flat' with those on the 'hill.' In order to have an intelligent comprehension of this possible connection a brief outline of Butte's geology, as worked out so far, is necessary.

The Butte granite, intrusive in Cretaceous sedimentaries, is itself successively intruded by aplite, quartz-porphyry, and rhyolite, the whole complexed by different series of faults. It is these that have had the most important bearing on the deposition and distribution of ore. The fractures in the original igneous rock have been filled, some by dikes, some by veins; some of them displace both dikes and veins. The veins are sharply differentiated as silver and copper, but many of the former become cupriferous in depth. There has been much speculation as to the relation between these silver and copper veins, but as this article deals with Butte copper, the silver question must be temporarily shelved.

Perhaps the best idea of the structural changes affecting this great granitic mass can be gained by looking south from the mine office of the Butte & Bacorn Mining Co., three hundred yards north of the horseshoe bend of the Great Northern railway. To the left and east towers the main range of the Rocky mountains, stretching twenty miles south to the snow-capped peaks of the Highland mountains. To the right and west rises Anaconda hill, with its north and south prolongations. Between these lies a long narrow depression known as the 'flat.' Evidently it was here that the first faulting took place when the continental divide was formed. Its scarp rises precipitously and represents a vertical displacement of at least a thousand feet, the lateral throw being at present indeterminate. This would have made Anaconda hill higher than the main range of the Rockies before the block settling occurred. Naturally the country near the displacement would be much broken and readily attacked by erosion, thus forming the 'flat.' Subsequently a lake occupied this basin, its sediment and a torrential wash now extending to a depth of as much as 600 feet.

Perpendicular to this main line of displacement a parallel series of east and west fractures might well have been formed. These possibly determined the earliest system of veins in the district, the great east-west series, embracing many of the large copper producers. As stated in the preliminary report of W. H. Weed*, these earliest lodes were displaced first by a set of fractures having a northwest course, and later both were displaced by a still more recent system having a northeast course. These are spoken of as 'systems' because they comprise numerous faults, all having the same general strike.

The structural conditions, thus briefly outlined, were the chief factors influencing the subsequent mineralization. Weed distinctly differentiates a primary and a secondary mineralization, the former being the normal vein-filling and the latter giving the workable ore. The former are probably formed by metasomatic replacement of the granite through hot ascending solutions which extracted their mineral from other adjacent granitic masses. The intrusive quartz-porphyry is closely associated with many of the big copper veins, as in like manner the rhyolite is identified with the silver veins. That it is a necessary adjunct has not been proved. The mineralizing solutions have entered the fissured granite and changed its hornblende and mica to pyrite. Usually, the ore fades into country rock, the well-defined clay selvages and 'slickensides' being due to subsequent movement.

Copper minerals were associated with this pyrite, but the large bodies of chalcocite which have been the chief source of Butte's wealth are undoubtedly due to secondary enrichment. Meteoric waters have dissolved the copper from the lean ores of the oxidized zone and deposited it

*_Bulletin_ 213, United States Geological Survey, 'Ore Deposits at Butte, Montana.'

by reaction with pyrite in the zone of secondary enrichment. The upper portion of the big veins consists of iron-stained quartz, carrying silver ore, with but little copper, except in the gouge. With depth, partly oxidized and decomposed copper ores appear and soon change to



Eastern Part of Butte.

1. Parrot. 2. Neversweat. 3. Anaconda. 4. Mountain View. 5. Parrot. 6. Nipper. 7. High Ore.



Central Part of Butte.

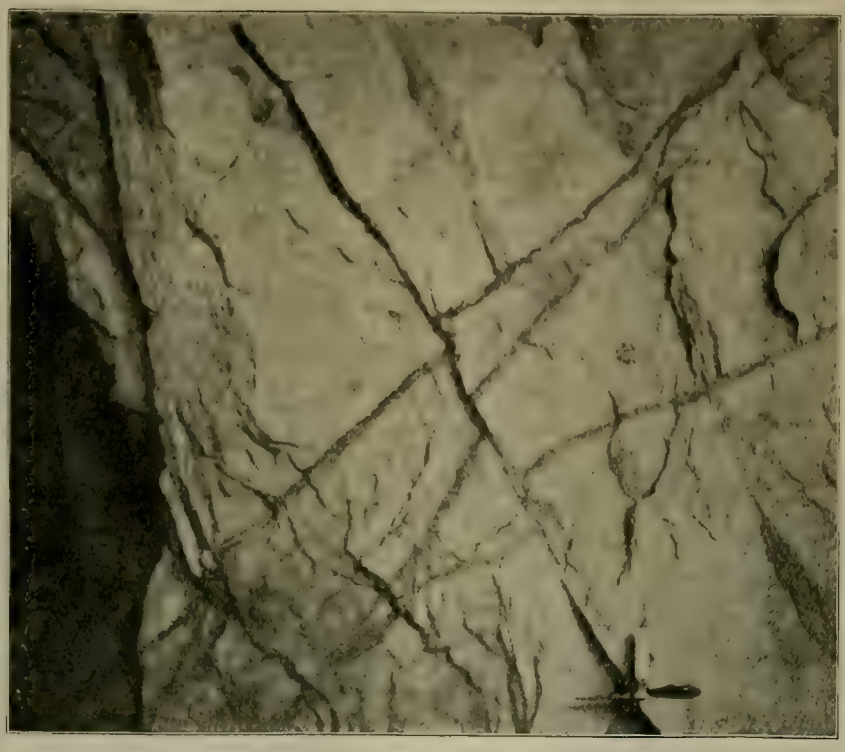
9. Belt and Diamond Mine. Miners' Homes in foreground.

the sulphides, chalcocite, bornite, enargite and cupriferous pyrite.

The experiments of H. V. Winchell have made clear the genesis of the Butte chalcocite ore, which constitutes more than 75% of that extracted. It occurs crystallized or massive on pyrite, quartz, zinc-blende, altered granite and enargite, filling crevices and fractures both in the veins and in the country rock. His theory, as proved by synthesis, is that copper glance, cuprous sulphide, is precipitated from solutions of copper sulphate by SO_2 formed by the oxidation of pyrite, according to the following reactions:

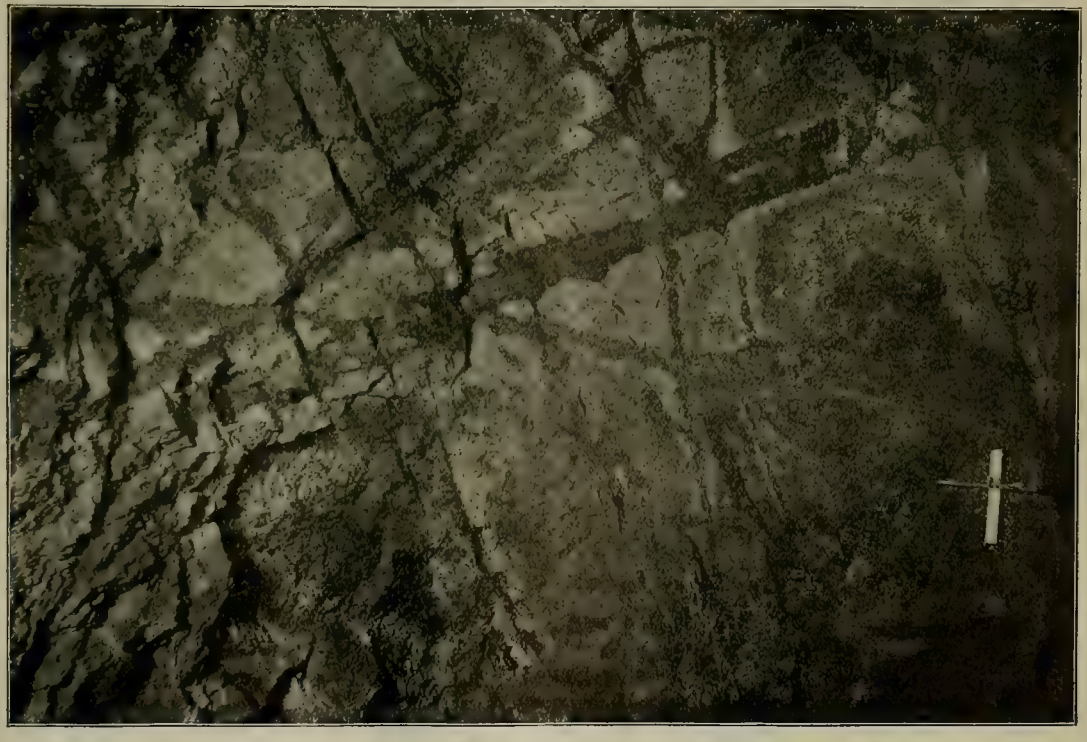
$$FeS_2 + H_2O + 6O = FeSO_4 + SO_2 + H_2O$$
$$2CuSO_4 + SO_2 + 2H_2O = Cu_2SO_4 + 2H_2SO_4$$
$$FeS_2 + H_2SO_4 = FeSO_4 + H_2S + S$$
$$Cu_2SO_4 + FeS_2 = FeSO_4 + Cu_2S + S$$

Chalcocite thus synthetically deposited on pyrite crystals, defies distinction from that found in nature. An important principle governing this re-precipitation must not be overlooked, namely, the relation between erosion and oxidation. If erosion be faster than oxidation, the soluble metal will be carried away from the vein, but if the rate of oxidation is greater than that of erosion, the metal when liberated will be carried down by the descending solutions.



On the 600-ft. Level of the Mountain View Mine. Showing Faulting of Veinlets.
By Courtesy of the U. S. Geological Survey.

Weed's recent work on the vein-system cannot be better summarized than in an abstract of his own description: "The evidence is conclusive that the east-west veins have been faulted. The identity of the Original-Parrot and Anaconda lodes is established, the displacement being due to the Blue vein. Further east the Anaconda lodge is again thrown to the north by the Mountain View fault. The same faulting has displaced the other veins of this part of the district. The veins of the great producers belong to this east-west system, in which the trend is remarkably uniform. The Silver Bow vein is an exception. There is some evidence to show that certain southeast fractures were mineralized in the earliest vein-forming period, and some of them were re-opened when the later faulting occurred. These earlier east-west veins differ in structural and mineral character from the later lodes, and, except where faulted and enriched, lack their high silver content. The northwest fractures faulted the east-west veins,



On the 700-ft. Level of the Rarus Mine. Joints Mineralized by Pyrite.
By Courtesy of the U. S. Geological Survey.

and of these the three largest—the Blue vein, Mountain View vein, and Grey Rock—are mineralized, but not so generally as the older veins; the ore occurs in shoots; it is high grade and shows enrichment. The Blue vein has been developed for a mile, and to a depth of 1,000 ft., proving a heavy producer in several mines. The veins of both the east-west and the northwest systems are cut and displaced by those of the northeast system. The best example of this is the Rarus fault, for the ownership of immensely valuable orebodies has hinged upon the geological conditions in the Rarus and adjoining claims. A careful examination of all the accessible workings has proved that the Rarus faults have displaced all the veins. The cut-off is as sharp as if made by a knife, and high-grade ore abuts against the fault-breccia. The veins displaced are so close together that in many places the cut-off ends of different veins are opposite. The fault is compound, consisting of two fissures, the easterly with a dip of 45 degrees, the westerly with a dip of 30 degrees, and these fissures differ in strike. The block of ground between them is crushed, the included vein-segments are broken and their orientation is disturbed by a tilting of the block. The actual fault-fissures are marked by attrition-clay containing rock and mineral fragments. When hardened by infiltrating solutions this mixture resembles the quartz-porphyry. As the material between the faults contains workable orebodies, stoping is sometimes continuous from one vein, across the fault, to another. Whatever the legal decision may be, there is no geological continuity. There has been some ore deposited in the fault-fissures, but not sufficient to form a new north-south vein along the fault, being confined to the proximity of older ore, upon and about which it was precipitated."

It is to be noted with regret that the vein systems thus defined include only those on Anaconda hill. The great deposits of alluvium separating this hill from the main range cover all the outcrops, and what little work has been done in this area but complicates a tangled problem.

There seems to be only one reason why the big copper deposits should be confined to the hill. Winchell's work on the theory of secondary enrichment implies an absolutely free circulation of solutions. Anything hindering such free circulation will allow the copper minerals to remain in the upper part of the vein, but is not likely to allow any re-precipitation in depth. In other words, the vein will contain the original copper minerals, but will not be enriched by a secondary precipitation. The existence of great masses of rock that look as though they have slid off the main mountain range since the time of the first block-faulting, would suggest that in slipping they may have choked the channels and prevented a free circulation. There is apparently no present means of determining whether this sliding took place before or since the most active period of secondary enrichment. There are a number of newly formed companies working in this vicinity, but no great depth has been reached as yet. As might be expected with a poor circulation of meteoric waters, the croppings are excellent, running high in copper. It is to be hoped, and even expected, that such indications will lead to ore in depth. In a number of cases the strike and dip of the veins correspond with those on the hill.

THE practice of hardening steel dates back to the remotest antiquity. Homer, Pliny, and Lucretius refer to the hardness imparted to iron taken from the forge and plunged in water. The ancient Egyptians heated meteoric iron in the forge at a temperature somewhat below the melting point until it had absorbed enough carbon from the fuel to give it the requisite hardening properties, and then fashioned their weapons and tools from the metal thus obtained.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The fragment of water-worn cobble, marked No. 1, Rampart, is Olivine-basalt.

Of the two rocks from Barron, Wash., No. 1 is Feldspar-porphyry and No. 2 is Quartz-porphyry.

The rocks from Scott River, Cal., marked H., are Sericite-schist and Mica-schist, the latter containing much quartz, and stained by iron and manganese oxides.

The ore from Independence, Cal., marked F. C., is evidently igneous rock heavily impregnated with iron oxide. Iron ore of this description is frequently gold and silver-bearing, and occasionally forms the outcrop of copper sulphide ore.

The three samples from Inyo county, Cal., marked H G., may be described as follows: No 1. is a cellular quartz stained with iron oxide, and containing a little yellow ochre. Gold is also visible in numerous places. No. 2 is a fragment of a diabase dike, in which occurs a veinlet of calcite. Ordinarily we would not expect to find gold in rock of this character but its occurrence in dike rocks is not unknown, and it is not at all improbable that the gold occurs chiefly in the calcite seam. No. 3 is apparently from a seam of calcite in a quartz vein. It shows no sign of containing either gold or silver, but this can be determined by assay.

METALLIC TELLURIUM is extracted from the slime which is the waste product of the electrolytic process employed at the Baltimore copper works in the treatment of copper-mattes from the West. This residue, after the removal of silver and copper, consists principally of the sodium salts of silicic, selenous, and tellurous acids, the last named being in large excess. The method consists in the precipitation of the metal and its conversion into basic tellurium nitrate, $Te_2O_3(OH)NO_3$. This finely crystallized salt serves as an excellent means of obtaining pure tellurium. The basic nitrate is decomposed by heat; the oxide thus obtained is dissolved in hydrochloric acid; and from this solution the metal is re-precipitated by means of sulphur dioxide. Crystallization of the basic nitrate from a nitric acid solution removes selenium completely from the tellurium, and also furnishes a convenient method for the separation of other metals.

EDWARD WHYMPER, CLARENCE KING and other mountaineers with powers of scientific observation have noted that it is at night that the great falls of rock take place. It is due to the freezing of the water which has trickled during the day into the clefts, fissures, and crannies. As the sun goes down the action of the frost serves as a lever to shatter and loosen the rock. Whymper says that in each of the seven nights which he spent upon the southwest ridge of the Matterhorn, at altitudes of 11,844 to 12,992 ft., the rocks fell incessantly in showers and avalanches.

THOSE who would, but cannot, stand upon the highest peaks may console themselves with the knowledge that they do not usually yield the views that make the strongest and most permanent impression. Marvelous some of the panoramas seen from the greatest peaks undoubtedly are, but they are necessarily without those isolated and central points which are so valuable pictorially.

Ketchikan, Alaska.

Written for the Mining and Scientific Press
By H. W. Turner.

Ketchikan is situated on Revillagigedo island in extreme southern Alaska. It is the first port of entry reached by the Alaska steamers and is the distributing point for Prince of Wales, Gravina, Annette, and other adjoining islands.

The climate is warm and excessively moist, rain falling during the greater part of the year. Snow seldom lies long at the sea-level, but at an altitude of more than 2,000 ft. there is usually a heavy covering during six months. The slopes of the ridges are steep and rugged, but well covered with coniferous trees up to about 2,000 ft. The summits are often quite bare of vegetation or soil; this denudation probably being the result of the scouring of glaciers that appear to have covered these islands at one time. Rocks near the shore, which have been protected from weathering by gravel and sand, show glacial grooving and striations plainly and the lake-beds of Prince of Wales island appear likewise to be ravines dammed up by glacial detritus.



Ketchikan, Alaska.

The bottom of the numerous inlets of the sea and interior sounds is a marvel of marine life, star-fish of various colors, sea anemones, and even corals are to be noted. These deep, narrow inlets or fiords are an important feature of the region, permitting as they do, steamers of 20-ft. draught to reach nearly all the camps on the islands. Water transportation allows of cheap freight and encourages the mining of low-grade ores, such as occur in most of the mines.

The entire group of islands of the Ketchikan district is fairly seamed with mineralized lodes, the ores being rich in sulphides and adapted to smelting operations. Copper is the most abundant valuable metal; it usually occurs in the form of the yellow sulphide (chalcopyrite), though oxidized ores are found to a limited extent, especially on the west side of Prince of Wales island at Copper Mount and elsewhere. At present there are two smelters treating copper ores, one at Hadley on the eastern side of Prince of Wales island, and one at Copper Mount on the western side. Much of the ore, however, is shipped south to the Vancouver smelters and to Tacoma, the freight rate in large lots being as low as $1.50 per ton and the distance carried about 600 miles. Free-milling gold ores, as in the Cracker Jack at Hollis, are known, but apparently they are not abundant. On the eastern side of Prince of Wales island extending from the head of Kasaan bay and Tolstoi Pt. to Cholmondeley sound, is an area of rocks called by the United States geologists Kasaan greenstone. These are probably old andesites metamorphosed and rendered schistose by pressure. Nearly all the greenish minerals they now contain, such as hornblende, chlorite and epidote, are of secondary origin. These rocks are much intersected by dikes of diabase, apparently intruded after the greenstone had been rendered schistose, as the diabase itself is usually massive, and does not exhibit the effects of pressure.

Copper ores have been found in this greenstone at numerous points, notably at Stevenstown, northwest of Hadley; at Mt. Andrews and Karta bay, on Kasaan bay; and near Kiam on McKenzie Inlet, a south branch of Skowl Arm. In all cases the chalcopyrite occurs in grains and seams disseminated through magnetite, ordinary iron pyrite, or marcasite. Locally, in all the mines, rich boulders of chalcopyrite may be found, but they constitute a small portion of the ore. The average content of copper estimated on the basis of a large tonnage is from 2 to 4%. As but little detailed information was obtained of the mines in general, those of the Omar Mining Co., which were carefully inspected, will be more fully described.

The Khayyam mines, operated by the Omar Mining Co., are situated at an altitude of about 2,400 ft. above sea-level, on the summit and north slope of a ridge 2.8 miles in an air-line from Kiam, a post-office on McKenzie inlet. A section of the Powell adit and main workings is shown in Fig. 1. The ore is sent down on an aerial tram one mile long to bunkers and thence trans-

ported 2¾ miles over a surface tram in cars to bunkers on the beach, where it is loaded onto boats and shipped to the smelter. The cars are run in trains of six cars each, one train taking about 15 tons of the pyritic ore, which takes about 11 cu. ft. per ton. The trams can transport 300 tons per day of 24 hours.

The Khayyam ore is chiefly a white iron pyrite (presumably marcasite) with disseminated chalcopyrite, and with more or less pyrrhotite or magnetic iron pyrite. It occurs in the form of lenses in the greenstone, much of which is a finely fibrous hornblende schist. These schists are nearly vertical and strike about S 75 deg. E, the ore lenses lying about parallel with the schistosity; they are of varying size, several of them crop out at the surface, where they usually show as gossan with some bunches of rich chalcopyrite and considerable pyrrhotite. The gossan is composed chiefly of scoria-like limonite, but not in any large amount. It contains but little gold and silver, and hence is not valuable as ore. The wall-rocks and sulphides immediately under the cropping are irregularly richer in chalcopyrite, which may be due to secondary enrichment. There are, however, no considerable bodies of such ore and the mainstay of the mines is the ordinary marcasite with disseminated chalcopyrite, showing a copper content of not over three per cent. No chalcocite was noted, nor is it to be expected in depth. The ores close to the surface appear to have the character they may be expected to retain in depth. They are essentially pyritic and admirably adapted to pyritic smelting. The zones of secondary enrichment so common in copper deposits are wanting or they are too limited in extent to be of importance.

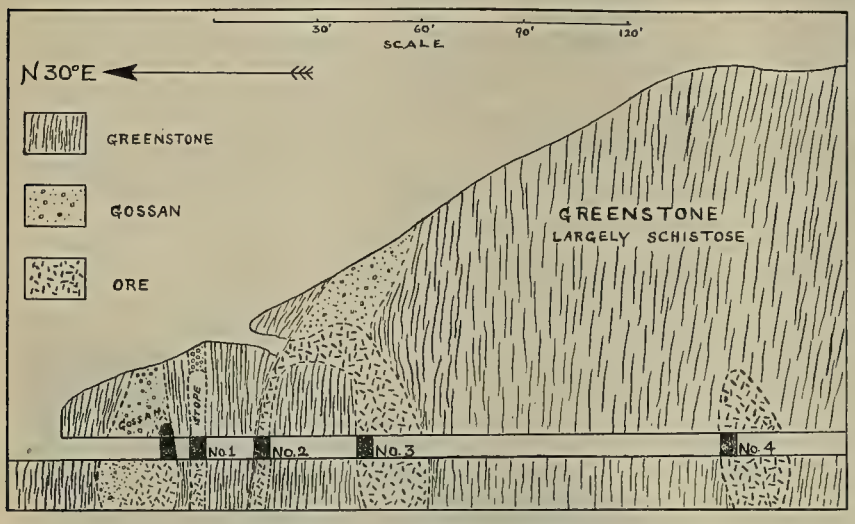


Fig. 1. Cross-Section of Khayyam Mine.

There is abundant evidence that during late Tertiary time a mild climate obtained throughout the western temperate zone of North America. In late Tertiary deposits we find remains of palms, and of animals the nearest relatives of which now live in warm climates. During this warm period, we may imagine that the surface was disintegrated to a considerable depth, and under such circumstances the upper portions of the lodes may be presumed to have been in an oxidized condition, and the copper lodes may easily have had zones of secondary enrichment not far from the surface. This warm period was succeeded by the glacial epoch, when vast masses of ice from the continental region of British America moved southward, covering the islands at least as far south as Vancouver island and Puget sound. The loose and disintegrated surface of the late Tertiary may be presumed to have been scoured off by this moving ice-sheet, removing the upper portions of the lodes and any ores of secondary enrichment that existed. It is true that at Copper Mount oxidized ores are said to be found for some distance below the surface, but as these are (in part at least) in limestone, the open spaces along the lode formed by the leaching out of the lime and the consequent introduction of surface influences readily account for oxidation in depth.

As it has been stated that the chief sulphide of the Khayyam ores is pyrrhotite, an average sample was taken from No. 4 lens in the Powell adit, about 100 ft. below the surface, and pulverized. The sand was treated repeatedly with a horseshoe magnet and 7% of the pyrite was found to be magnetic, the remainder being chiefly marcasite. There being three sulphides common in the Khayyam ores, a separation of these was made for assay to determine if the precious metal accompanies any particular sulphide. The result, as determined by Lochiel M. King, of Oakland, California, was as follows:

	Gold, oz.	Silver, oz.	Copper, %-
Chalcopyrite	0.16	3.60	29.97
Pyrrhotite	0.03	0.62	2.67
Impure marcasite	0.03	0.40	2.32

The copper content of the pyrrhotite and marcasite is



Dock at Sea-Level Mine, Revillagigedo Island.

to be attributed to finely disseminated chalcopyrite, but the much higher content of the precious metals in the chalcopyrite strongly suggests that the gold and silver favor the chalcopyrite. A qualitative test of the pyrrhotite for nickel was made and none found. In addition to the above sulphides, there is a little zinc sulphide present in the ore. The future of copper mining on Prince of Wales island depends largely on the discovery of large orebodies.

Substitutes for Tin.

In the *Mining Journal*, London, there appeared recently an interesting article on the above subject by Mr. L. Parry. He said that in view of the tremendous rise in the price of tin, it becomes a matter of importance to consider the question of substitutes for the metal. The diminution in the price of aluminum, the practically limitless supply of raw material and the physical properties of the metal are facts which must at once appeal to the technical imagination, and point to this—the most abundant of the metallic elements—as a possible substitute for tin. At the same time, it is not the only metal which has to be considered in this connection.

The world's annual production of tin is now about 91,000 tons, and the principal uses to which the metal is applied are in the manufacture of:

A.—Tinplates; tinplate holds from 2 to 3% tin. Two samples recently assayed by the writer contained 2.65% (thin piece) and 3% (thick piece) respectively. The tinplate production of South Wales is probably about 12 to 13 million boxes, and that of the United States about the same. Germany is probably the next largest producer with about 1,000,000 boxes, or, say, 1,350,000 tons for the world's production; the tin in tinplate is stated on good authority to run about 2%, which means that 27,000 tons of metal are consumed for this purpose.

B.—Machine bronzes and brasses; these account for the greater proportion of the world's consumption.

C.—White alloys, such as solder, type-metal, pewter, britannia metal, white bearing-metals. Of these it is important to note the increasing consumption of white bearing or anti-friction metals, which contain tin up to 90%. They also contain 5 to 20% antimony as an essential constituent—a point which may have some bearing on the increased price of antimony. Of other white alloys, we have capsule metal, tea lead, tinfoil, electric fuse metal, accumulator metal, metallic packing, fusible alloys and the various white alloys holding tin which are used for making ornaments and toys.

D.—Ornamental bronzes and gold and silver-plated white metals.

E.—Tin crystals, tin oxide, etc. A considerable amount of stannous chloride is consumed in various branches of textile industry; tin oxide is the principal constituent of many polishing powders.

A.—With regard to tinplate, there is little doubt that many of the uses to which it is applied could be fulfilled by aluminum or galvanized iron, or, assuming the manufacture of such a material to be a practicable proposition, by aluminum plate—that is, iron coated with aluminum. The price of aluminum is now about that of tin, and about fourteen times that of tinplate; and as the specific gravity of aluminum is, roughly, one-third that of tinplate, the cost of aluminum sheet would be about four and one-half times that of tinplate of the same thickness. Aluminum is sufficiently tenacious and malleable to replace tinplate, it resists atmospheric influences well, and, whether as plate or sheet, could be employed in the manufacture of many domestic utensils and vessels used for containing food-stuffs, tobacco, etc. There cannot be much objection (apart, of course, from cost) to its use in the case of tea, coffee, cocoa, biscuits, tobacco; but in the case of preserved fruits, meat, and vegetables, the objection has been made that aluminum is attacked by organic acids. This is a very important point, and one upon which there is much conflict of opinion; it would seem that the liability of aluminum to attack by fruit acids depends largely on its purity. In any case, we must remember that the aluminum industry is in its infancy, that the power of resistance of the metal to organic acids is a matter which requires investigating, and that we can scarcely condemn its use in such connection on the strength of scanty knowledge available.

B.—Machine bronzes and brasses may contain up to 15% tin, according to the purposes for which they are required. If we put the average percentage at five, we shall probably not be far wrong; and if we remember that the world's annual output of copper is now about 800,000 tons, and that a large proportion of this is employed in the manufacture of machine bronzes and brasses, we see at once that this must mean a correspondingly large consumption of tin. Many of the essential physical properties of tin-copper or tin-copper-zinc alloys may be obtained by the partial or complete substitution of tin by aluminum, manganese, nickel, or iron, though it would, perhaps, be incorrect to say that such an effect could always be produced, or that such alloys would be invariably cheaper. The object of successful brassfounding is the production of a suitable alloy at a profit. If, for instance, the price of tin, aluminum, and nickel happened to be about the same, and it was found possible to obtain the properties required in a gun-metal holding 90 of copper and 10 of tin by adding 1 or 2% each of aluminum, nickel, and tin, to a copper-zinc base, it would certainly pay to do so. A rise in the price of tin should stimulate research in the direction of such combinations.

C.—Of the important white metals, we may say at once that solder and type are required on account of such special and definite combinations of physical properties, that their replacement by other metals to any appreciable extent is quite improbable. With regard to white bearing-metals, again, the tin which is used in their manufacture confers physical properties upon them which can scarcely be otherwise obtained, so that the consumption of tin in their manufacture is likely to increase rather than to diminish.

D.—With regard to ornamental bronzes, it is difficult to speak with any degree of certainty; the use of tin is, however, not an absolute necessity, and its consumption for the purpose has been diminishing for some time. On the other hand, an increased amount of tin is probably now used in the manufacture of white metal ornaments, for example, in the case of white bronzes. Many white metal combinations are employed in making ornaments, and it is probable that the demand with the regard to quality readily accommodates itself to the supply. The quality of such goods probably varies far more than the price; if tin keeps up in price for a year or two, it will probably be found that the percentage of tin in white metal ornaments will diminish considerably. With regard to white metals used as bases for electro-plating with gold and silver, it has already been found possible to use aluminum; the processes are still in their infancy, but no doubt the use of aluminum for this purpose will become more and more common.

THE CRACKS in reverberatory furnaces and in boiler foundations may be chargeable to any one of a number of causes, or to a combination of them. Among these are: Insecure foundation which settles unequally; expansion from heat; poor materials used in construction thrust, due to improper construction.

Secondary Enrichment Upward.

Written for the MINING AND SCIENTIFIC PRESS
By COURTENAY DE KALB.

Cases of re-arrangement of the metalliferous contents of lodes by rejuvenation of the circulation of solutions as a result of later faulting of the enclosing rocks are not uncommon, but the phenomenon which is the subject of this contribution is an instance of true secondary enrichment from normal causes occuring after all movement in the rocks had ceased, and after the solutions had effected metasomatic replacement to the point of complete cementation of the fractured zone.

The writer was engaged in the development of a number of copper claims scattered along the north shore of Lake Huron, and was surprised to find that in many of them a promising orebody near the surface rapidly decreased in copper content until at a depth of from 51 to 25 ft. the copper minerals had practically disappeared. On comparing notes with Major Robert G. Leckie, who had also been exploring the same region for the Orford Copper Co., I discovered that he had met with similar disappointment in a considerable number of cases. Prof. Willett G. Miller likewise reported numerous instances of a similar character in the district east of Lake Nipissing, both in copper and lead veins. The region where these phenomena occurred was extensively glaciated, and, so far as my own experience went, these superficially rich copper veins were all found where the glaciation had produced *roches muntonnees*, entirely bare of vegetation except in the intervening depressions.

Since many of these veins were of large dimensions, and some of them so extremely rich near the surface as to produce quantities of ore running as high as 10% copper, or more, I determined to make a more exhaustive test of one deposit, and ascertain its condition at some depth below the surface. The property selected for the purpose was that known as the Grattan mine, about three miles east of Massey station on the Soo Line of the Canadian Pacific railway, and one mile north of Spanish River. The rocks of the district consisted of quartz-diorite, rising out of the swampy river bottoms in a rolling mass of egg-shaped glaciated domes, the general elevation of which was about 250 ft. above the swamps. Beginning at the swamp, and extending over the summit of one of these domes, and thence traversing the *roches muntonnees* for nearly a mile, was a shear-zone 20 ft. wide, within the boundaries of which were innumerable outcrops of quartz stringers from the thickness of a knife-blade to a foot wide. Elsewhere within the shear-zone, the surface rock appeared to be nothing more than weathered diorite, upon which the lines of flowage induced by the shearing movement were quite generally traceable. On chipping the surface of this flow-diorite, however, an abundance of chalcopyrite was everywhere revealed, quite concentrated at a distance of only one-eighth of an inch below the outer weathered crust, although no sign of the existence of copper minerals was observable until such chipping had been done. A number of test-pits were sunk at frequent intervals along the outcrop of the shear-zone, across the domes and down the steep incline of the southern front of the hill to the edge of the swamp. In every case chalcopyrite, with some bornite, was found in abundance close to the surface, gradually decreasing within 10 ft. to less than two per cent copper. From one-eighth of an inch to two inches below the surface, the copper would generally average from 10 to 15%. This condition was uniform at all altitudes above the swamp, so that the copper-bearing portion of the vein was evidently a mere shell or cap.

A shaft was sunk, starting just above the water-level of the swamp, which was carried down 40 ft., and a drift was then extended from the bottom 20 ft. under the swamp, at which point water came in so freely that it was deemed unwise to proceed farther. To a depth of 15 ft. the average copper content was three and one-half per cent. Below this the copper and iron sulphides rapidly decreased in quantity, and at 25 ft. the vein was entirely barren of metalliferous minerals, but the quartz in places showed seams which were pitted as if pyrite had been dissolved out of them, and the diorite in the shear-zone was also porous. At a depth of 30 ft. some pyrite began to appear in the diorite, which condition continued without change to the bottom. The most obvious explanation of the phenomenon, of which the Grattan lode furnished a characteristic type, was that the shear-zone may have originally contained a slight concentration of copper from the surrounding diorite; that owing to glaciation, and lack of soil and vegetation to hold water, the precipitation instead of penetrating the rock promptly ran off into the surrounding depressions; that during the relatively short but intensely hot summer the evaporation was so rapid as to induce a movement of an abnormally active capillary circulation upward, the solutions thus ascending carrying copper and iron sulphates which would re-act upon the sulphides of iron and copper in the usual way, forming secondary enrichments near the surface; and finally that, owing to the intensely heated surface of the rock, which often exceeded 120 deg. F., the moisture would be completely vaporized at a short distance below the superficial crust, which crust therefore would contain no copper, whereas the copper would be most highly concentrated at the point of such volatilization a fraction of an inch below the surface, as actually found. The inability of the surface waters to seep into the hard, glaciated rock would preclude any action contrary to this upward concentration of the copper.

The Massey mine is eight miles northwest of the Grattan and is a producing property, presenting similar phenomena. There was no superficial evidence of copper, and, in fact, the mine was discovered through the accident of a belated hunter building a camp-fire upon the bare glaciated outcrop of the vein. The heat split off a shell of the upper rock, revealing a mass of chalcopyrite near the surface. The upper portion of the vein was highly enriched, but the quantity of copper decreased until a fairly uniform average of from three to four per cent was reached at a depth of 90 feet.

AT HASOKURA, in Mongolia, the natives smelted galena in a small furnace or hearth 15 in. diam. with the addition of iron in the form of old coins. The charge was 83⅓ lb. of ore and the third (last) cake of slag of the preceding operation; 23⅓ lb. of iron coin, or 19⅙ lb. of new iron; 58⅓ lb. of charcoal. The smelting lasted two hours, there being three operations in the morning; in the afternoon the hearth was repaired. The product was about 50 lb. of lead to each operation. The lead (except the poorer part) was cupelled by two women on a hearth of wood-ashes, and the litharge afterward reduced again to lead; with a loss of 25 to 30% lead in the whole process. The monthly product of silver (1¼ lb. avoir.) amounted to 0.05% of all the lead.

MOST of the pumice used in the United States is imported from the island of Lipari, in the Mediterranean, where it occurs in enormous quantity. It is mined and shipped so cheaply that little is produced elsewhere. Some pumice has been brought to the Pacific coast in recent years from Hawaii. Any deposit of pumice in the Western States, to be commercially valuable must be of excellent quality and situated where cheap transportation is available. In 1905 the production of pumice in the United States was about 1,800 tons, valued at $5,500.

An Improved Method of Framing Square Sets.

Written for the Mining and Scientific Press
By A. A. Steel.

Mr. M. K. Orr, one of the mining students of the University of Arkansas, has suggested the plan of framing square set timbers, here illustrated. This plan is the result of a desire to use on all the members nothing but square tenons and shoulders so that each timber can be completely framed with but one setting of the simplest type of machine, such as the Joshua Hendy framing-machine recently illustrated in this journal. For squared timbers this has but five saws at each end and a device for rotating the timber exactly 90 deg. As far as known to the writer all square sets now used have centrally placed tenons. This requires oblong tenons on at least one series of the timbers. These may be framed on a complicated machine, but in practice they are usually framed square and altered later.

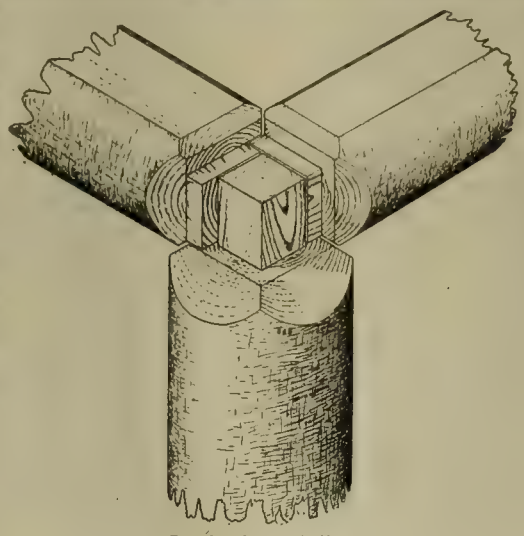


Fig. 1. Isometric View.

Fig. 1, 2 and 3 illustrate Mr. Orr's system applied to round timbers with the usual bevel and top slabbing. Since everything is square and all the shoulders are of the same size, the bevel requires but two additional saws at each end of the machine, and these diagonal saws need never be shifted.

The figures represent the timbers framed for the usual case of greatest pressure downward, so the tenons of the

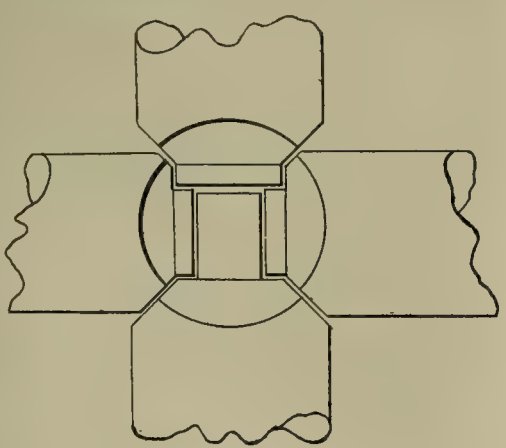


Fig. 3. Side Elevation. Round Timbers.

posts touch. The horizontal pieces have 8 by 8-in. tenons 2 ft. long, on the corner of a 10 by 10-in. shoulder. By reference to Fig. 2 and 3 it will be seen that the saws of the machine can be arranged to cut one deep notch on the top of the timber and merely square the tenon on the bottom. When the timber is rotated 90 deg., the same cuts are made upon the former sides and the framing is complete.

The tops of the posts have a central 6 by 6-in. tenon 8 in. long and the bottoms a 10 by 10-in. tenon, 2 ft. long. The socket for the bottom of the post is thus wide and shallow, and the fine ore which falls into it, can be cleaned out with little annoyance. Since the bottom tenon is also unusually large, there will be less temptation for the timbermen to saw the bottom of it off rather than clean the socket. It will be expected commonly to fill the socket with a 2 in. plank 10 in. square to keep out the dirt until time to put in the new post. This will afford an excellent foundation for blocking the set against the roof. The tops of the horizontal timbers must be slabbed at a fixed distance from the tenon for convenience in laying a smooth floor.

Besides the assistance of the bevel, the joint shown gives a minimum perpendicular bearing surface two inches wide or of 16 sq. in. to resist displacement of the timbers by blows from flying rocks or by distortion of the sets under heavy pressure. It thus quite simply avoids the greatest objection to round timber sets. It uses the full strength of the tree, which even if figured in simple compression is over one and a half times as strong as the largest square timber that can be cut from it. Owing to the bevel joint there is also less pressure against the side of the thin tenons and they are less liable to be sheared off. Since this framing permits the use at the same joint of all sizes of timber above the minimum, it is easy to increase the strength of the new sets as pressure in any stope becomes greater.

An incidental advantage of Mr. Orr's framing is that the caps and girts are identical, so that less frequent setting of the framing machine will be necessary, and the

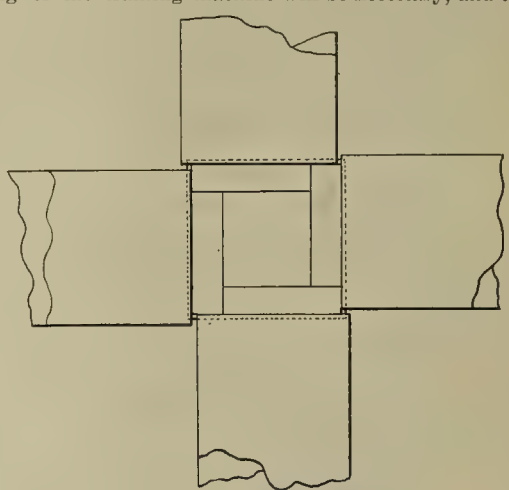


Fig. 4. Plan. Square Timbers.

timbermen will have less bother selecting the required timbers. For the same reason, with round timbers, the smallest caps may be placed always in the direction of least pressure. If the timbers are slabbed on but one side only, adjoining caps must be turned end for end as shown in Fig. 3. Timbers that are accurately sized and squared can be framed the same way. If we imagine the round timbers shown in the figures slabbed on all sides until the bevels disappear, the drawings will represent the framing for 10 by 10-in. pieces. The bottom of the posts will then just fit into the socket with no framing except cutting off square.

In order to make a snug joint without a bevel, and in

spite of any warping of the timbers and irregularity in size or angles, the outside of the tenon may be gained as much as necessary. This will require the same sort of machine as that used for framing squared posts. Fig. 4 is the plan of 10 by 10-in. timbers gained half an inch. They are drawn in position, to show that there will be a clearance of a quarter of an inch next the only uncut side of the timber. This gaining throws the abutting caps slightly out of line. A little study will show how easily larger timbers can be fitted to the joint of small ones.

This new plan of framing has the advantage of greater simplicity of the framing machine, greater flexibility in the size of the timbers and interchangeability of caps and ties. From the last, it follows that the horizontal timbers are equally secure against displacement, fewer settings of the framing machine will be needed and there will be less confusion underground. It is hoped therefore that some mine superintendent may be sufficiently interested to give it a trial.

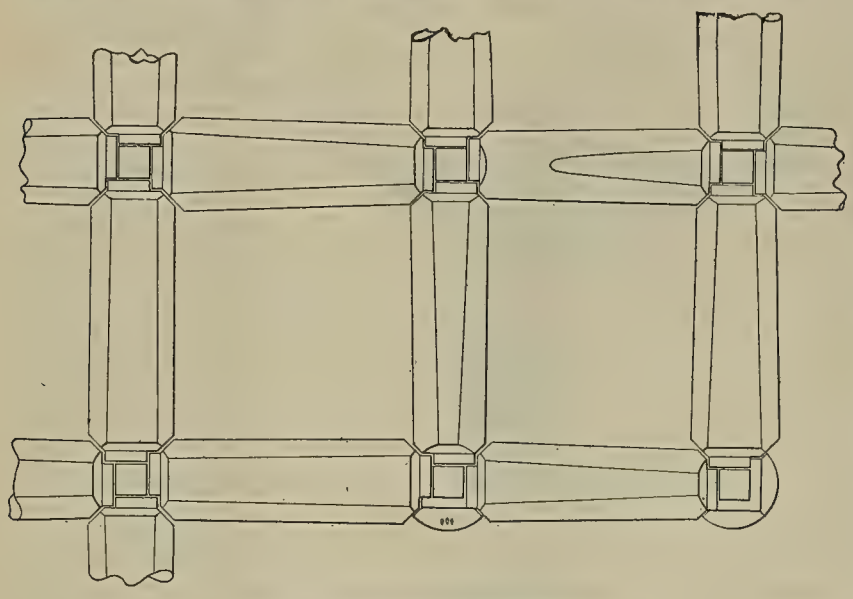


Fig. 2. Plan of Framing. Round Timbers.

IN the Colorado desert of California and Arizona, travelers notice large areas covered with a mosaic-like pavement of rounded, polished pebbles, there being few large stones and scarcely any sand among them. These areas glisten in the sunlight and at a little distance may be mistaken for water. W. P. Blake offers the following solution to account for the occurrence of these mosaic mesas: "It appears certain that the surface-sheet of pebbles, and in many localities of small fragment of rock and bits of fossil silicified wood, is the result of an accumulation by the gradual removal, by the wind, of sand, silt or finer materials from around and below the pebbles, undermining them, removing their support, and permitting them to fall to a lower level, where they accumulate by concentration until the whole surface is closely covered by fragments too large and heavy to be moved away by the wind. Such a deposit of pebbles or fragments may thus represent all that were originally distributed through several feet of thickness of sand and lighter alluvions. In this way there may be a removal of a large amount of fine materials from the general surface of a region, lowering its level, until, by the complete covering and protection of the surface by the concentration of the heavier fragments, eolian denudation is arrested, and the further lowering of the surface is stopped."

Repairing a Gold Dredge With Thermit.

The strenuous work required of a gold dredge naturally necessitates many repairs of working parts. These are not always easily made by ordinary means, but recently in California an interesting illustration was given, according to the *Electro-chemical and Metallurgical Industry* of the facility with which thermit may be applied to repairs of machinery in mining fields remote from foundries and machine shops. Thermit is a mixture of finely divided iron oxide and aluminum, and the reaction (which is started by igniting a special ignition powder with a match, consists simply in the combination of the aluminum with the oxygen of the iron oxide. Since this gives out an enormous amount of heat, the iron set free is obtained in form of a superheated liquid soft steel at 5,400 deg. F. within 30 seconds after starting the reaction.

It is self-evident that it is possible to do many things with such superheated liquid steel for the repair of iron or steel machinery and for other purposes in iron and steel metallurgy. Other practical advantages of the method are the simplicity of the necessary outfit and the ease of transporting it. The repair referred to was made at Wallace, Calaveras county, to a dredge owned by the Mokelumne Mining Co., of which Willlam C. Colley is general manager. The trouble was principally with the upper tumbler. The driving-wheel to which the bucket-line is hung drives it by sprockets. This bucket-line consisted of 64 buckets, each weighing 1,100 lb. and having 5 cu. ft. capacity. The tumbler shaft was 12 to 13-in. diam., and had a hub keyed to it by two heavy quartering keys. The hub was tapering and 20 in. diam. on the large end. The shell, with the heavy sprockets, slipped over this hub and was drawn over the taper by three bolts, $1\frac{3}{4}$-in. diameter.

Through this fault, probably alignment, the whole tumbler, hub and shell, crept along the shaft, notwithstanding heavy bands designed to prevent this, and through a faulty and slightly large bore of the hub, the keys could not be kept in place and were gradually disintegrated by the working of the hub.

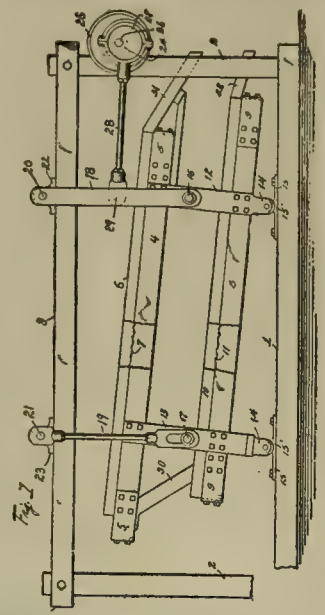
The Pacific representative of the Goldschmidt Thermit Co., L. Heynemann, 2721 Clay St., San Francisco, after examining the shaft and tumbler, concluded that it was possible to fuse the tumbler immovably to the shaft; that is to say, to cast a thermit steel band on each side of the hub, which would fuse both to the shaft and face of the hub. The repair was made in the beginning of April, the tumbler, shaft and hub being placed in a field near the dredge. The heavier end of the hub was treated first. On April 10, after rain in the forenoon, both cores were fitted. On April 11, late in the afternoon, after the shaft had been heated to 'black red,' the reaction took place. The crucible containing the thermit mixture was placed over the mold. On April 12 the cores were fitted for the other end, and by 10 o'clock that night they were ready for action.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

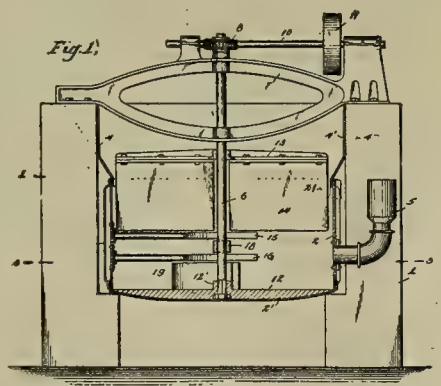
ORE-SCREENING MACHINE.—No. 825,081; Alfred Schwarz, New York, New York.

A screen comprising a plurality of sections secured together by pairs of plates, one pair being of less length than the other and the said sections secured thereto in substantially parallel relation in planes inclined to a horizontal plane, grooved rollers supported by said plates, cam-surfaces upon which said rollers rest and upon which they are adapted to be moved, and means for imparting a longitudinal reciprocating movement to the screen sections.



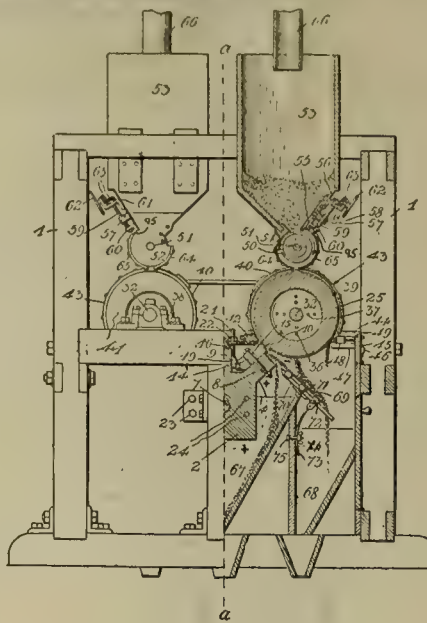
SEPARATOR FOR USE IN THE CONCENTRATION OF ORES.—No. 825,080; Alfred Schwarz, New York, New York.

In a separator for use in the concentration of ores the combination of a kettle adapted to contain water, shelves supported within said kettle, scrapers co-operating with said shelves to impart a continuous movement to the contents of the kettle, an overflow-discharge outlet at the top for the concentrate and adhesive agent, and a discharge-outlet at the bottom of the kettle for the tailing.



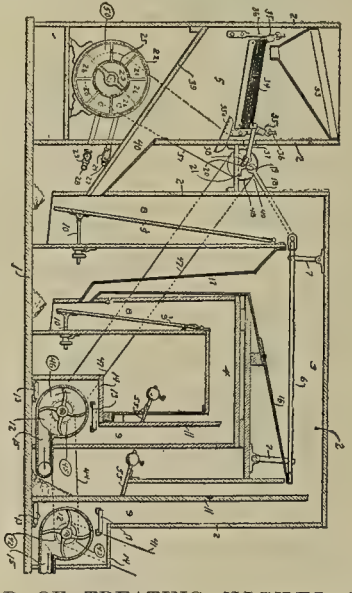
MAGNETIC ORE SEPARATOR.—No. 824,893; Joseph Weatherby, Jr., New Cumberland, Pennsylvania.

In a magnetic ore separator, the combination of a magnet having a pole-piece presenting an inclined surface and an extension of said pole-piece also presenting an inclined surface and forming a shoulder, a cylindrical revolving magnetic carrier element presenting a surface above and moving past said pole-piece and extension and forming an air-gap between them, means to feed material in a thin layer to the air-gap, and means to subject such material, while its movement through the air-gap is magnetically retarded, to force exerted in a direction at an angle to the lines of magnetic force in the air-gap and also at an angle to the plane of movement of such material with the carrier.



ORE SEPARATING AND CONCENTRATING MACHINE.—No. 824,927; Joseph L. Hellyer, Iconium, Iowa.

In an ore-separating machine, the combination with means for drying and sizing the ore, and a primary ore-treating trunk adapted to receive the ore from the drying and sizing mechanism and containing a shaker-riddle; of a secondary ore-treating trunk mounted beneath said primary trunk, a connecting-pipe mounted between said primary trunk and the receiving portion of said secondary trunk, depending valve-boards mounted in the receiving portions of said trunks, suction-fans mounted in the discharge portions of said trunks, and means for operating said shaker-riddle and said drying and sizing mechanism.



METHOD OF TREATING NICKEL-COPPER MATTE.—No. 825,056; Woolsey M. Johnson, Iola, Kansas.

The herein-described method of recovering nickel and copper from matte, which consists in treating the matte with hydrochloric acid, thereby obtaining a solution rich in nickel and a residue rich in copper, electrolytically separating the nickel from said solution, and electrolytically separating the copper from said residue.

Hydraulic Classification.

Written for the MINING AND SCIENTIFIC PRESS
By S. R. SWAIN.

A hydraulic classifier must fulfil certain requirements, such as sorting column, hydraulic upward currents, settling arrangement, and method of eliminating rejected fine. The sorting column should be given close attention. Upon its diameter depends the maximum capacity, but this capacity will be influenced by the hydraulic pressure and the size of the spigot-product desired. It is obvious that only a certain amount of material can pass a certain opening, and that the hydraulic pressure will lessen the amount according to its force. Also it is necessary that the classified particles should not be crowded too closely while falling in the upward current, for such would cause an accumulation, and the current would lose its control. The length of sorting column will be a matter of even closer study. Upon it depends the nicety of spigot-product. Its length should be such that the upward current will have lost any influence from eddies or counter-currents, and long enough so that the ore particles which are desired as a spigot-product will have sufficient falling space to be thoroughly influenced by the upward current. The quantity of irregular particles in the ore will greatly influence the length of the column, for such particles require longer action for a better sorting.

The hydraulic upward current should be absolutely uniform and under instant control, and its mode of introduction one that will cause the least number of eddies and counter-currents. Experiments have shown that an evenly rising current is better than a vortex when the length of sorting column is correctly proportioned.

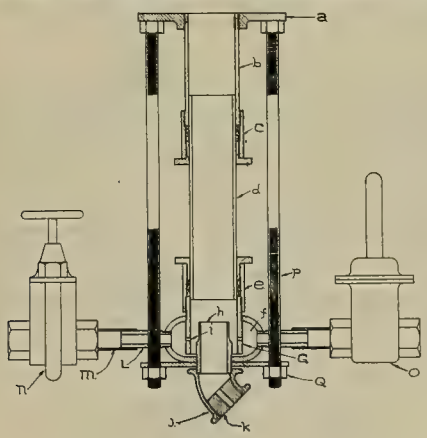


Fig. 2.

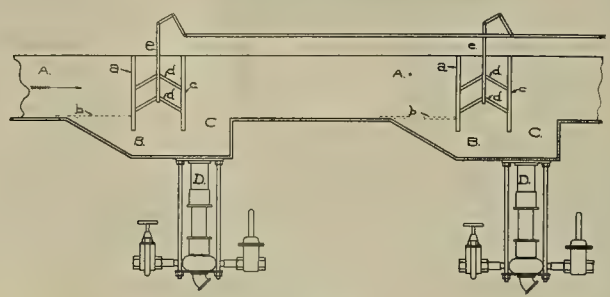


Fig. 1.

The method of eliminating rejects is a feature that is best combined with the settling arrangement. The action should be positive and so adjustable as to accommodate any difference in conditions, such as change of feed or amount of water.

It may seem to the reader that the numerous requirements are too vague, but by close attention to the following description and sketch, I believe the simplicity of the device will be appreciated and the ease of adjustment understood.

Fig. 1 shows sketch of the box or trough. The feed is introduced at A and flows as the arrow points. The inclination of the trough is such as to cause an easy flow that will carry the largest particles along the bottom; a is a fixed baffle-board, whose lower end extends at least four inches into the pocket B; b is a screen, the openings of which are at least five times the size of the largest particles; c is a movable board which is adjustable by the toggles d d by means of connecting rod e. The sorting column D is bolted to the bottom of the pocket so that it is directly under the opening C. The sorting column is shown in Fig. 2, a is a flange for bolting to bottom of the pocket; b is an iron pipe, which with the glass tube d forms the sorting column; c and e are stuffing boxes to tighten the joints at these points. The glass part d of the sorting column is of proper diameter to slip into the pipe portion of it; f is the water chamber; g is the outer tube which through the perforations i distribute the hydraulic water in the annular opening between itself and the inner tube h; J is the discharge pipe and K is the spigot. The weight is carried by rod p which screws into the flange a, while the nuts q, q on the long thread of the rod are adjustable to varying length. The main hydraulic water is admitted through a gate valve in n and a short hose m to chamber f, and another supply through a Lunkenheimer 'Handy' gate-valve o to the same chamber.

Let us follow the pulp through one compartment, which would be one classification: The ore being fed at A is carried by the water and the inclination of the trough to the first pocket; there it easily passes the screen b, the meshes of which are of large dimension. The tendency of the screen at this point is slightly to retard the finer particles in the eddies formed directly beneath the wires, thus the coarser particles settle, while the fine is kept in agitation and suspension. The pulp passes under the fixed baffle-board a, and directly over the sorting column D. The hydraulic pressure has been regulated for the desired spigot-product. The spigot has a constant opening. The elimination of eddies and counter-currents in the column is accomplished by the peculiar arrangement of water-chamber and the outer tube with perforations and the inner tube which properly distributes the hydraulic. This gives us a quiet upward current which allows properly weighted particles to fall, while those too light are held without the tube. Perhaps the length of tube is not correct for the product desired. A glance at the interior of the sorting columns through the walls of the glass portion of it will quickly tell and its length can be adjusted by means of the slip-joint shown at c in Fig. 2. Should the fine be accumulating over the column in the pocket to the extent that it falls in the upward current, the glass portion of the column will show it, and an adjustment of the movable board c contracting the opening C will carry this fine to the next compartment.

When an ore of components of similar gravity is being treated, it might be well to have an additional current which would be pulsating in effect and would tend to disperse an accumulation in the top of the column. It can be easily arranged by the use of the 'Handy' gate-valve o, Fig. 2, which can be mechanically operated to open at stated intervals. Another feature would be the connecting of rods e, e, Fig. 1, so that by moving one all would be moved a proportionate amount. This would allow of the changing of carrying water, while by this adjustment the spaces C C could be instantly changed to the proper size for disposing of the rejects from the sorting columns.

It will be seen that the combinations introduced in this classifier allow of thorough adjustment, permitting of variations of feed and water without impairing efficiency. The length of sorting column is readily changed to accommodate conditions. The glass portion of the tube allows of interior inspection, which shows the action and immediately suggests any adjustments needed. The scheme may be carried through any number of pockets. The final overflow should be impounded in a settling-box, the discharge of which may be regulated for thickening.

No dimensions are given, and neither is the capacity mentioned, but these can easily be solved by anyone caring to try the device. This classifier is especially adapted to lead-zinc-iron classification, and experiment has shown its fitness for other classes of work.

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Editorial.

AFTER AN INTERVAL of 13 years the Government is again buying silver bullion for coinage at the mints. On Wednesday of each week, beginning August 15, and henceforth until further notice, tenders will be received by the Director of the Mint at Washington for the delivery of silver to the mints at Philadelphia, Denver, or New Orleans. The several mints are also now buying bullion containing more than one-half its weight in silver. Heretofore only bullion was received containing more than 10 parts gold to one part silver.

REFERRING TO our comment on the Fresno Copper Company, last week, we learn that Mr. J. S. MacArthur has been chosen by the directors and shareholders to verify Mr. Siebert's report. Mr. MacArthur holds the confidence of people at Glasgow, and elsewhere. It remains but to add that the information given at a shareholders' meeting on July 27 confirms the criticisms and the moral we ventured to offer.

ON ANOTHER PAGE we publish a communication from the Russian consul at San Francisco in which he warns the public against certain doings of the North East Siberia Company. In another journal we made editorial reference to this matter, two years ago, and warned investors or speculators from engaging in these long-distance ventures in a country where it is easy to get mining rights, but most difficult to bring them to financial fruition. In other words, while the American company referred to may have promised more than it can perform, the Government of all the Russias has failed to 'make good' in several Siberian concessions, granted to Englishmen and to Americans.

WE PUBLISH an article describing the method of hydraulic air-compression at the Victoria copper mine, in the Ontonagon region of Michigan. As fuel was expensive, the abundant water was applied in an ingenious manner to the generation of power. How it is done, Mr. C. H. Taylor, the inventor, tells us in his interesting article. Water is taken from the river under a head of 71 feet, and air is admitted into the falling water through a number of small pipes; the water, with the air thus entrapped, is piped through three shafts to a depth of 330 feet, where it spreads into a large chamber cut in the rock. Here the air, now at a pressure of 117 pounds per square inch, rises from the water and occupies the dome of the chamber, whence it is piped to the surface. The tail-water meanwhile escapes through a lower tunnel that communicates with an incline shaft, leading to surface, 260 feet overhead. The air has the low temperature of the water and the loss due to rise of temperature in compression is minimized. The energy thus generated is applied to various kinds of machinery, including

hoists, drills, and stamps. To Mr. Taylor and to Capt. George Hooper, the late manager, is due the credit for this clever application of natural power.

Unrest in Mexico.

The Anglo-American papers published in Mexico are uniting with the local authorities in denying the reports current in our daily press concerning the threatened outbreak among the laboring people, with the cry of "Mexico for the Mexicans." Last week we published a letter from a mining engineer living in Mexico, who undoubtedly wrote in good faith. As far as we can ascertain there is some ground for the fear of an outbreak, especially near the border. The truth lies somewhere between the two accounts; it is not as threatening as the papers on this side of the Rio Grande make out; yet it is more serious than those in Mexico are willing to allow. The difference in wages paid to the native as compared to the foreigner, has provoked protest, and there are enough unruly people to stir up trouble, especially where the management of a mine is not harmonious. The next president is not likely to be another Diaz, who, despite the revolutionary training of his early adventurous years, has proved himself a strong and efficient ruler, thoroughly fitted for his time and country. Mexico is well policed; there is no chance for riot so long as the central Government remains coherent, and even in the separate States the Governors are men well fitted to suppress disorder. But should Diaz be succeeded by a weak man, whose authority could be speedily undermined by an ambitious military leader, the social equilibrium would be upset and under such conditions the laboring classes might rise to protest against the dominance of the foreigner. There is an enormous amount of English and American capital in Mexico, there is also a large foreign population composed mostly of active educated men; it would be no slight matter if either the lives or the money introduced into Mexico during recent years were jeopardized. We do not anticipate it, but a sense of false security is not preferable to one of needless timidity.

In commenting thus, we would be sorry to give color to any of the fabrications that have been printed on the basis of the facts we refer to. During the past week the San Francisco *Call*, and other daily papers, published a tissue of absurdities and falsehoods such as would disgrace even the yellow journals of W. R. Hearst. It was a story that Col. W. C. Greene and other speculators had hatched a conspiracy to create trouble along the border "with the hope that a serious complication would force the southern Republic to cede to the United States the rich mining district of Cananea in Sonora." And in this connection the names of the Venture Corporation, Mr. F. W. Baker and Mr. Ernest Wiltsee, were mentioned as representing English interests that were to draw Great Britain into the embroglio. We have no communication from, or with, these gentlemen, but we know enough to be able to stamp the yarn as an impudent falsehood, concocted to make a sensation among those who happen not to be informed on Mexican affairs.

Cheap Shares.

The Curb Market at New York has become prominent lately. There are about 2,500 brokers 'on the curb'; it is said that in their business is included trading in not less than $5,000,000 worth of stock having a par value of $1 per share; from 2,000 to 3,000 corporations have such stock and there are several companies the capital stock of which is at par worth but ten cents per share, some of them having stock of the par value of one cent per share. A court decision that the New York stock tax of two cents per share applies to the par value of stock, whether it be $1 or $1,000, has shaken the market on Broad street, so that some of its peripatetic members have gone to Jersey City and some to Boston. The decision affects the cheap shares, such as eleven Tonopah stocks, an equal number of Goldfield issues and nine that represent speculative mining at Bullfrog. There are 35 of these Nevada stocks that sell below $1 per share, not necessarily because the mines are of small value, but by reason of the large capitalization, divided into an enormous number of shares of small denomination. This is in curious contrast to the practice of the early days on the Comstock when the shares in a mining enterprise were divided into as many feet as it possessed in length of lode, so that a share, equivalent to one foot of outcrop, might sell for several thousand dollars. It is no wonder that they lack water in the desert mining centres of Nevada, seeing how much of it they put into their stocks. The idea, of course, is to put the purchase of shares within the reach of the small dabblers in mining speculation, most of whom prefer a thousand shares at 50 cents apiece to one share at $500. There is a notion that in buying small-priced shares, the purchaser cannot lose much; this is a fallacy; while a loss of 10 cents per share looks small in one case as compared to $100 in the other just instanced, the result is the same. A share selling at 15 cents with a par value of $1, appears to invite a rise of 85 cents, there being a supposition that the nominal rating represents the real worth of the mine when developed; so on the other hand $99 for a $100 share appears to suggest the probability of a rise of only one per cent, to par. If the capitalization were in direct ratio, or equivalent to, the value of a mine, such reasoning might do; with things as they are, it is only childish. It is true low prices make for a wider market, but they also mean a less substantial basis of investment, facilitating a panic just as much as they make it easy to create a boom. Not that we deprecate reasonable speculation; mining is essentially a speculation, it is the chance of a large gain that warrants the risk of a big loss. The chief objection to the low-priced share is that it permits of an inflated capitalization; a man is apt to think a ten-cent share cheap, without stopping to consider, for instance, that there are a million of them; the same man will look upon a $100 share as expensive, even though there be only 5,000 of them. Usually the small denomination is a lure to catch the unwary. Therefore the check to such trading on the New York Curb is not likely to hurt legitimate mining, while it does emphasize once more the urgent need for a respectable mining exchange at the financial centre of the United States.

By the Way.

In a recent issue of the *Electrical Review* there is an excellent editorial on transmission of power by gas, as against electricity. Our contemporary in New York says:

Probably nine persons out of ten if asked what is the best way of transmitting power will say, "by means of electricity," and the tenth person will also give the same reply, unless he happens to be a gas engineer. Until very recently the problem of transmitting power in large quantities over great distances was considered almost purely electrical, and although text-books on power transmission and generation touched upon the possibilities of other means, such as compressed air and gas, these did not receive very much attention. Recently, however, power transmission by means of gas has been under discussion, particularly in England, where the local conditions at London may possibly have had something to do with the respectful consideration the proposal has received. It should be pointed out that these plans do not contemplate abolishing the electric motor. The gas is to be used for transmission only, and not for distribution, for in the latter use the motor is unrivalled. In fact, this fact is recognized by the gas engineers themselves, as is shown by the following quotation from Mr. C. A. Smith, when urging, in the *Electrical Times* (London) for June 21, power transmission by means of gas: "Of recent years a good deal has been said about generating electricity at the pit's mouth and transmitting it to various industrial centres, but it will be considerably cheaper to manufacture producer gas at the pit's mouth and transmit it through pipes to the industrial centres, there to use it in driving gas engines for generating electricity, and also for heating and furnace work. The question of distribution and transmission of power must not be confused. For the former it is agreed that there is no agent to compare with electricity; for the latter purpose it is suggested that it is more economical to employ producer gas and piping than electricity and cables." The emphasis is laid here upon the transmission of the cheapest form of gas, which is not only to bring cheap power to the city, but to do away with smoke.

Transmission by gas, it is true, will solve some of the problems not solved up to the present time by electrical transmission. While all admit that no small motive power can compare with the electric motor, and that electric lamps are the best illuminating agents yet devised, when it comes to heating, the electric system is at a disadvantage. Electrical heaters are perfectly efficient—that is to say, all the energy supplied to them is converted into heat, but the losses which have taken place before the energy reaches the heater are very great, while in the gas system all of the energy of the gas is converted into heat, though all may not be utilized. In other words, we start with our energy in the form of heat, which is obtained by burning the gas. In the electric system we must carry this through a number of transformations, one of which is not very efficient. This disadvantage applies only to electric energy generated from fuel. When obtained from other sources the transformation ratio is high; and the cost depends mainly on the cost of the apparatus.

Since the introduction of electrical power into industrial and commercial life there has been a marvelous development. Methods of communication have been vastly increased; the efficiency of the worker and the electric motor is revolutionizing our methods of applying mechanical power either for transportation or manufacture. It is becoming such an important agent that all water powers have taken on a new significance and are rapidly becoming one of the most coveted of a State's resources. The utilization of these powers has been by electrical means, and while we have divided this process into parts—generation, transmission and distribution—we have considered these divisions rather from the standpoint of convenience. In this work we have had no rivals, but now the gas man would have us believe that when it comes to transmitting power obtained from fuel that all of our work has been vain and that we must fall back upon other methods. The proposal is interesting, and it will be carefully analyzed; but until further evidence is produced the nine out of ten will still retain their original opinion.

Siberian Concessions.

The Editor:

Sir—In the interests of all parties concerned, the Imperial Russian Consulate at San Francisco hereby begs to communicate to you the following intimation, issued by the Imperial Russian Department of Commerce and Industry.

It has come under the notice of the said department that the 'Northeastern Siberia Company, Ltd.', of St. Petersburg, Russia, whose director in Siberia and America is Mr. John Rosene, 234-235 Pioneer Bdg., Seattle, Washington, offers to all companies or persons desirous of sending prospectors to Cape Chukotski, Eastern Siberia, for mining purposes, to obtain for them the lease of one or more claims, same to be chosen and located by them and to remain in the possession of the lessee, his heirs and legal representatives, successors and assigns, until the mine is exhausted—if they comply with all the conditions of the contract signed with the company. Whereas:

1. According to the Russian mining laws, mining on the Chukotski peninsula and in the whole of the Primorsk province is prohibited to foreigners;

2. Under the contract signed with the Russian Government, the Northeastern Siberia Company, while having the sole right, until 1910, to prospect for minerals and work mines on the Chukotski peninsula east of the rivers Angeioma and Ennenkal, can transmit that right to other persons only by special permission and in its entirety, without parceling the concession into separate claims; and

3. It will be possible for the company, under the general mining laws and under the stipulations of the abovementioned contract with the Russian Government, to transfer such claims only after the above-mentioned term of exclusive rights in the whole of the peninsula shall have expired and after the allotment to the company of such separate localities which the said company may wish to retain;

Therefore, the Department of Commerce and Industry warns all persons who have already entered or are desirous of entering into agreements with the Northeastern Siberia Company, with a view to leasing claims on the Chukotski peninsula, that the Imperial Russian Government will not admit or recognize the rights of such persons to these claims, although the same be based on agreements or contracts concluded with the above named company.

KOSAKEVITCH,
Consul.

Imperial Russian Consulate, San Francisco.
25 July,
——— 1906.
7 August,

IN Western Australia carefully conducted experiments proved that on the ore mined there, 2½ in. was the minimum of economy in size in crushing at the breaker, and hat any increased efficiency gained in stamping rock of smaller size than 2½ in. was more than offset by the increased cost of smaller breaking at the crusher.

Special Correspondence.

LONDON, July 31.

The latest bid for money in connection with the "revival of a great home industry" is made by the Cornish Tin Properties, Ltd. The capital is £20,000 in shares of £1 each, of which it is said 15,000 have been subscribed for in cash. Nothing daunted by these meagre resources the company expects that its chief immediate profits will be derived from: (1) The advancing of capital on profitable terms for the sinking of trial pits and for exploration and development of properties which have favorable indications or which are considered likely to prove valuable. (2) The advancing of capital on the security of licenses and leases or on a profit-sharing basis for the erection of plant and machinery to those possessed of properties upon which promising lodes have been opened up. (3) The re-sale of licenses, leases and rights as options are acquired from owners, etc. (4) Providing preliminary expenses for the formation of companies to acquire tin mining properties. (5) The brokerage and commission earned by acting as intermediaries between sellers and buyers. (6) The income from investments made in shares, interests, and securities of undertakings (and the re-sale of these) which the directors consider desirable or concerning which the directors may have special information. "In order to secure the earliest possible information of new discoveries and operations and the benefit of local experience, knowledge and practical advice, the directors have constituted an Advisory Committee, consisting of" (more or less) "experienced engineers resident in the centre of the industry." It is easy enough to obtain "licenses, leases and rights as options," and "the sinking of trial pits" is well within the scope of the company, but peddling in shares, even with the advantage of "special information," is a risky business even for a board of directors. While calling in the aid of engineers on the spot for the front page of the prospectus, it is not surprising that this and kindred undertakings should fight shy of the latest report of the Government Inspector of Mines, already noticed briefly in my correspondence of July 4. Regarding the "larger mines" in Cornwall this gentleman refers to them as "for years battling against difficulties and disappointments," mainly owing to the inability in the past to "build up sound financial conditions," now happily possible owing to the high price of tin. With an old-world flavor, in keeping with the conditions of West Country mining, the report in question deprecates the "mere speculative element"—in looking for greater energy and wiser policy in the future development of the industry. Does the Inspector mean 'investors' (who apparently enjoy the smile of his approval) to signify cost-book adventurers, and 'speculators' the shareholders in limited liability companies? If so, he may depend on one thing as certain, that unlike the wise men of old the 'speculators' will be found to remain in the East and will refuse to join the noble but attenuated army of 'adventurers' in the West in continuing a system of mining finance and development, highly suitable no doubt in the time of the Phœnicians but not adapted to the requirements of the twentieth century of the Christian era.

The dividend of 1s. 6d. per share just declared by Dolcoath for the half year (15% per annum) is a latter-day fact which appeals to all who put their money in mines. It is reported that the bottom of the mine is maintaining its value, the average yield of tin per ton from this point being quite 100 lb. and that the increased dividend is not due solely nor chiefly to the improved prices for metal, but to a general improvement throughout the mine and additional capacity of output. At the Tywarnhaile mine excellent progress is reported in unwatering. The whole of the plant is said to have worked continuously for the past four weeks, during which time the water in the Tywarnhaile section has been lowered to a vertical depth of 95 ft. below the adit. Both the 10 and the 20-fathom levels are now unwatered on the line of lode for a total distance of 2,800 ft. At South Wheal Towan, the water has been lowered 13 ft., and the water-level in Wheal Charles has gone down 18 ft. All of this is considered to show that a large area of country is now being drained and that electric-power pumping has, during the period since starting, been a great and continuous success. It is rumored that Captain William Teague has submitted a scheme to a London syndicate for the unwatering of all the abandoned mines extending from Wheal Busy, in the Chacewater district, to Violet Seton and adjacent mines at Roseworthy, near Camborne. The proposal is to unwater this great stretch of mineralized country by electrically driven pumps, and then commence the driving of a long cross-cut toward the Tehidy Estate. It is a large order, and the man on the spot is not averse to calling in the assistance of the aforesaid men of the East for its accomplishment. At this juncture Cornwall could do very well with a dower such as the late Mr. Beit's benefaction of £1,200,000 in aid of South African railways. Without some such windfall, it is safe to predict that the means available will be inadequate to show any very appreciable increase in the output of tin from Cornwall for the next two or three years.

The eloquence of the chairman at the general meeting of the Spassky Copper Mine Co., in March last, and the inspired press writings about that time have not availed to keep up the price of the shares—then at over £7, now about £2½ less. It may be seen from my correspondence of March 28, that this mine is situated in Siberia, 500 miles from a railway station, and that the smelting works are 72 miles distant by cart-road from the principal producing mine, also that the net profit for the first 15 months, on a share capital of £250,000 with £100,000 of debentures, amounted to £17,000. These facts appeared to justify my opinion that the price of the shares was not warranted by the position and progress of the Company. Subsequent events confirm this view. A circular has just been issued by the directors which states that, owing to the spring floods coming at the time when the new shaft at the colliery was being fitted up, and the old pumps were being replaced by new, it was impossible for a time to raise coal, and the new furnaces could only be supplied with refuse coal, which had been put aside on the surface in former years. In consequence, for two months, copper production was comparatively small. The directors report that they have received most satisfactory assurances of the desire of all leading men in Russia to assist in every way the mining and commercial development of Russia, and particularly Siberia, with the aid of foreign capital, also that "evidences are abundant that it is well known that the vast undeveloped riches of Siberia will soon be one of the most important factors in the future of the Empire." Apparently the directors might have added in all sincerity that "evidences" were also "abundant" that there are people in Europe who would be nothing loath to part with shares in Spassky Copper at a large premium, rather than wait for the development of the "vast riches of Siberia."

The Government's proposals with regard to the new Transvaal constitution made last night in Parliament, are declared to be favorably received by the Kaffir market. If, as seems to be feared in certain quarters, manhood suffrage swamps the British vote, a situation might be created to which mine-owners would not perhaps object. It may be conceded that the huge fortunes built up during

the old Kruger administration would not have been possible under a paramount British administration.

BUTTE, August 11.

The Butte & Superior Copper Co., Ltd., with a capitalization of $6,000,000, has just been organized in Butte and incorporated under the laws of Arizona by Butte, North Dakota and Michigan men. The company is one of the strongest lately formed to operate in this district; it has purchased from W. A. Clark and associates the Blackrock, Niagara, Raymond and Four Johns mines, and from the Helena & Butte Mining Co. the Jersey Blue, all situated in the North Butte district, a short distance above the properties of the North Butte Co. The consideration for the four mines is nearly $2,000,000, half of which was paid for the Blackrock, a mine at one time famous as a silver producer and which was involved in the first of the big mining suits tried in the local courts. For several years the Blackrock has been worked under lease by the Blackrock Mining Co., the principal shareholders of which are A. P. Peake, of Valley City, N. D., and John H. Simpson, of Butte, who for 18 months have been working on the organization of the new company, and in acquiring interests in the different properties. In addition to the four developed mines named, the company has also secured the Pardee, Prescott, Paris, Pueblo, Pekin, Paul, Peake and Parker, eight claims situated west of the properties of the Butte Hill and Butte & Bacorn companies north of the city. The Blackrock is opened to a depth of 500 ft., and has been thoroughly developed by Mr. Peake and his associates since they have had possession of it. The Niagara, Raymond and Four Johns have been worked for a long time by lessees and some rich ore is being mined. Some prominent men are interested in the new company, including L. W. Harriman, of Minnewaukan, N. D., and a syndicate of Duluth and Calumet men. W. A. Clark retains a large interest in the company. Among the directors of the Butte & Superior Co. are A. H. Wethey, general mining manager for W. A. Clark, H. S. Clark of Butte, A. P. Peake, W. D. Clark, several Michigan men yet to be selected, and John H. Simpson, of Butte. Victor Rakowsky, of Duluth, superintendent of exploration of the Zeno Iron Co., spent several weeks in Butte examining the properties for the Michigan syndicate, and it was on his report that the new company was organized. The company owns 4,300 ft. on the strike of the vein, one of the biggest in the Butte district. The Blackrock has been opened by four levels, but there has been no stoping between the 300 and 500-ft. levels. There is also a large quantity of ore still above the 300-ft. level. Lately, driving on the 500 level eastward on the vein into the Four Johns has exposed a good-sized orebody. Assays show 30 to 40 oz. silver and 1 to 3% copper. The ore at one point is galena, assaying 86 oz. silver, an unusual ore in the Butte district. The Blackrock vein is from 50 to 105 ft. wide, and the formation is the same as that of the other mines on the hill. The vein is almost vertical to the 500-ft. level. The Butte & Superior Co. will equip the property with a new hoist and sink the Blackrock shaft to 1,500 ft., with a station every 100 ft. below the 800-ft. level. The old machinery is capable of working to a depth of 1,000 ft. and will be used until the new is installed, when it will be moved to the company's other claims northwest of the city. One of the officers states that with the new machinery it expects to mine from 500 to 1,000 tons per day. When the orebody is opened the upper levels will be turned over to lessees. The last shipment of ore made by the Blackrock Mining Co. averaged about 57 oz. silver, and returned $30 per ton.

W. A. Clark has purchased all outstanding interests in the Poser, Pilot and Elm Orlu, adjoining the Blackrock on the west, and will sink a shaft on the Blackrock vein. —— The Pittsburgh & Montana Co. has given a trust deed to all of its mining property in Montana to the Union Trust Co. of Pittsburg, to secure the issue of $3,000,000 in 6% bonds. The bonds are being issued to raise money with which to pay off an unsecured indebtedness of $2,600,000, and to provide a fund for exploration and development work. The mines of the company at present are producing about 100 tons of ore per day. It is the intention to sink deeper, and if sufficient ore is found to warrant the company in doing so, its smelters will be rebuilt and enlarged. A statement of the company's financial condition, filed with the Secretary of the State of Montana, shows a capitalization of $30,000,000, nominal assets of $30,281,233, and an indebtedness of $2,600,000. It is stated in the report that the actual value of the assets is but $7,500,000. The company will shortly put on a third shift at the mines. —— The face of the cross-cut being run from the 1,300-ft. level of the Original mine for the Davis-Daly Co. is 125 ft. from the shaft. This company is preparing to sink three shafts and has started work on two of them, and has just received an engine for the third. The company expects to be able to hoist ore from the Silver King and Mt. Moriah shafts in a short time.

TORONTO, August 10.

Forest fires have been raging in the country about Cobalt, especially in the vicinity of Latchford, driving away many prospectors and settlers. The region in the vicinity of Sudbury has also suffered. Heavy rains in the early part of the week brought relief and stopped the devastation in some places. The sanitary conditions of Cobalt camp are still under discussion. The truth of the matter appears to be that while the town itself is fairly healthy, the same cannot be said of all the mining camps of the area, where some sickness prevails, due largely to the hot weather.

The Temiskaming & Northern Ontario Railway Commission has called for fresh tenders for the mining privileges on the right of way of the road through the Cobalt area. The terms provide for a cash bonus of not less than $50,000, a rental of $50 per annum, and a royalty on the output at a flat rate of 25% of the value — in place of the sliding scale according to value, objected to by former bidders. The northwest 40 acres of the Cobalt townsite is also offered, the royalty in this case being on a sliding scale of 15 to 50% and the cash bonus not less than $22,000. —— T. W. Gibson, Deputy Minister of Mines of Ontario, has gone on a tour of inspection, including Cobalt, the Gillies timber limit, Sudbury and Sault Ste. Marie.

An American syndicate has purchased several valuable silver properties in the Port Arthur area, including the Silver Mountain, Badger and Beaver mines, which have not been worked for some time. M. A. Meyers, of Mt. Clemens, and Mr. Hanson, of Buffalo, who are largely interested, are directing pumping operations at Silver Mountain, previous to re-opening the mines for active work.——The Eldorado copper mine, in Hastings county, operated by the Medina Gold Mining Co., is giving satisfactory results. The shaft has reached a depth of 220 ft. The first shipment of copper matte will be made shortly from the new smelter.

The gold area around Lake Opastica, Quebec, will shortly be opened up. Sir Thomas Shaughnessy, president of the Canadian Pacific Railway, announced this week that as the result of a conference with Premier Gouin, of Quebec Province, the Canadian Pacific would at once send out surveying parties with a view to constructing a line through the country on the Quebec side of Lake Temiskaming. —— Valuable nickel-copper and corundum discoveries are reported near Pontiac, Quebec.

Assays of the former are stated to show 30% nickel and 15% copper, and the corundum percentage is placed at 90. —— An order in Council has been passed by the Dominion Government regulating the granting of water-power rights in the Yukon. Such applications may be granted on report of the Government mining engineer to the effect that the water applied for is available and that no other vested interest is affected. A fee is payable as follows: For 50 miner's inches or less, $10; 50 to 200 in., $25; from 200 to 1,000 in., $50; for every additional 1,000 in. or fraction thereof, $50. Certain amounts must be expended on development within a year and the work is to be completed at a specified date.

A deposit of red hematite ore has been discovered near Dunham, in the southern part of Quebec province. The belt in which this mineral occurs freely is eight miles long and encircles the base of the Little Pinnacle mountain, on the boundary line between Canada and Vermont. Milton Hersey, Dominion analyst, to whom specimens of the ore have been submitted, pronounces it the purest form of hematite of any found in Canada. Options have been secured on all the land around the base of the Little Pinnacle, and blasting operations have been begun by a company headed by Dr. Yates, of Dunham. Drummond McCall & Co., of Montreal, are said to have acquired interests in the deposit.

SALT LAKE, August 12.

The ore and bullion settlements reported by Salt Lake banks for last week aggregated $552,500, as against $539,000 the preceding week. The sales of the Salt Lake Stock & Mining Exchange amounted to 162,225 shares for $94,180.

At the annual election of the Black Diamond Mining Co., operating at Stockton, W. E. Beach, of Lafayette, Ind., was made president; J. R. Rand vice president; Charles W. Miller, Indianapolis, treasurer, and W. C. Alexander, of Salt Lake, secretary and general manager. An amendment to the articles of incorporation making the stock assessable was authorized.——The Honerine mill, at Stockton, is now operating with two shifts and the third will likely be put on about September 1.

Ore shipments from Tintic mining district last week amounted to 135 carloads, or about 6,000 tons, the contributing mines being: Beck Tunnel, 11; Centennial-Eureka, 39; Eureka Hill, 5; May Day, 4; Eagle & Blue Bell, 6; Carisa, 6; Mammoth, 12; Ajax, 4; Victor, 2; Victoria, 7; Grand Central, 8; Scranton, 3; Dragon Iron, 7; Swansea, 2; Bullion-Beck, 6; other mines, 3.

The Utah Development Co., of which Walter C. Orem, of Salt Lake, is manager, will soon be in the market for a mill. This company owns the Red Wing mine, at Bingham, in which some extensive bodies of milling ore have been recently developed.——The Boston Con. and Utah Copper companies, operating at Bingham, are making good headway in removing the overburden from the copper-bearing porphyry.——The management of the Standard Copper Co., of Bingham, has directed the cleaning out of the old adit on the Little Treasure claim.—— The management of the Ohio copper mine, at Bingham, has demonstrated that the zone between the All's Well and Last Chance fissures contains commercial ore throughout almost its entire width. Work has been suspended in a cross-cut run through it for 183 ft. It is now planned to commence sinking the projected deep shaft, which is to go 500 ft. deeper than the present lowest level.—— The Bingham Metal Mining Co. will make application for patents to 58 lode claims. The new compressor will be started this week and the main adit continued into the mountain. The plant will be operated by water-power and has capacity for five drills. The company has expended $25,000 in development and equipment during the past year. The claims are partly on the Bingham and partly on the Tooele county side of the Oquirrh range. Supplies are taken up to the mine from Tooele. The Utah agent of the company is H. A. Smith, McCornick block, Salt Lake.

The Utah & Eastern Copper Co., operating in Washington county, is working 150 men, and a traction engine and four four-horse teams handle the company's traffic between the mine and railroad. The smelter is running and 200,000 lb. of copper matte have accumulated pending the repair of roads recently destroyed by washouts. The three-compartment shaft which intersects the main working adit on the 600 level is down nearly 1,100 feet.

Ore shipments from Park City last week aggregated 2,012 tons, the Silver King contributing 620; Daly-West, 475; Daly-Judge, 653; Kearns-Keith, 53; Little Bell, 211. ——The July output of the Little Bell mine, at Park City, was 915 dry tons, for which the company received a net profit of $45,008. A compressor is being installed. ——The Daly-Judge Mining Co., at Park City, has made a net profit of $45,000 monthly since January 1 last. The mine is in excellent condition and there is nearly $100,000 in the treasury.

A deal was consummated in Salt Lake this week which places David Keith and Thomas Kearns in control of the Ely Mining & Milling Co., which owns 13 claims at Ely, Nevada. At the same time the purchase of the Maceo group, an adjoining property, was effected. Altogether about 400 acres have been acquired. Keith & Kearns have also secured control of the Success property in the Duck Creek district, 13 miles east of Ely.

The management of the Majestic copper properties, in Beaver county, reports that a large body of silver-lead ore has been exposed in the Gomer shaft of the Harrington & Hickory, which is a lead-silver mine, though at water-level copper makes its appearance.

The Continental Mines & Smelters Corporation, of which Henry M. Crowther, of Salt Lake, is manager, has decided to provide additional equipment for its aerial tramway now operating between the Continental-Alta mine and mill, five miles below, which will enable the management to handle the present output of other mines in the camp. Alta operators have suffered greatly because of scarcity of teams. By using the tramway, the situation will be materially improved.

CRIPPLE CREEK, August 13.

It is rumored that the Vindicator Gold Mining Co., whose property is situated on Bull hill, will follow the example of the Isabella Co. and begin the erection of a mill to treat the low-grade ore in the mine and on the dumps. A site near the town of Independence is said to have been decided upon, and the erection of the mill is to take place without delay. —— A clean-up was made last week by the Ironclad cyanide mill on Ironclad hill, resulting in a gold brick valued at $2,700; this was obtained from the treatment, at a profit, of ore running about $3 per ton, which is a very good showing indeed. —— Work on the new cyanide mill of the Isabella Co. is progressing rapidly; the excavating has been completed and 27,000 ft. of lumber have been used for supports and flooring. The size of the tank-building will be 190 by 34 ft., the tank capacity being 750 tons. The ore is expected to be treated at a cost of $1 per ton.

The Mary Alice claim on Battle mountain, situated between the Stratton's Independence and Portland properties, is being extensively worked by the Monument Gold Mining Co., of which Mr. Woodward is treasurer and general manager. A cross-cut is being driven at the 200-ft. level to intersect an orebody cut on the 400-ft. level below. At this depth the vein was not of sufficient grade to be worth extracting, but it is hoped that when it is cut at a less depth it may be of better grade.

Rich ore is being shipped by the Curry lease on the Lucky Gus of the Stratton Estate on Bull hill. On the 600-ft. level a rich mud streak, which is only two to three inches wide, is being followed. A car of ore was shipped from this place last week giving returns of between six and seven ounces in gold per ton. A small washer has been installed in the ore-house, which is used to wash the mud from the rock, making sorting more efficient. —— The two big hauling companies of the district have been consolidated, the Cripple Creek Coal & Transportation Co. being taken over by the Colorado Trading & Transfer Co. A good deal of ore-hauling is being done from the smaller properties to the railroad, and this work will now be done almost entirely by the Trading Company.

The American Eagles mine of the Stratton Estate on Bull hill, until recently under lease to Cox & Durbin, has been started up again by the Western Investment Co. The mine is being prospected on the various levels by this leasing company, which intends to take it over shortly under lease from the Stratton Estate.

The production of the Golden Cycle mine for July was in the neighborhood of 5,500 tons, which places it among the largest producers of the camp.——A strike of rich ore has just been made on the Henry Adney mine on Beacon hill. A shipment was made on the 11th inst., which is expected to give returns of about ten ounces. This find was made on the 600-ft. level, and 200 ft. north of the shaft, where a cross-cut has been driven to intersect the orebody discovered some time back on the 500-ft. level. The actual altitude at which this ore has been discovered is the lowest known working in the district, and the find is said to be the richest that has been opened up for many months.

COBALT, August 12.

Northern 'New Ontario' and northern Quebec are known to possess important mineral deposits and the reported gold discoveries in the latter Province, near Lake Opastica, excited no surprise. When the two Frenchmen, Renaud and Ollier, came into Cobalt camp in June, bringing rich gold samples and telling their story, their statements were readily believed by even the most conservative. There was a rapid rush to the city of Quebec by men with money, and, as the mining laws of Quebec are liberal, many hundred square miles were applied for. The Government of that Province leases land at $5 per square mile for three months for the purpose of prospecting, the lease being renewable as often as the lessee desires to pay the rental. Within a week after the two prospectors mentioned had reached Quebec, 200,000 acres had been applied for, the rental paid, and leases issued. Then began the rush to the promised land. The new discovery was supposed to exist near Lake Opastica, 140 miles north of Mattawa, which is on the main line of the Canadian Pacific railway, and 65 miles north of the town of Cobalt, on the Temiskaming & Northern Ontario line. Leaving the main line of the former railway, a branch, known as the Keepawa, runs north 40 miles to Lumssden's Mills, a lumber town at the foot of Lake Temiskaming. The railway skirts the Quebec side of the Ottawa river, which, for the entire distance, is interrupted by chutes, rapids, cascades, and waterfalls. At the Mills a steamboat company has two large boats running up and down the lake.

The Temiskaming & Northern Ontario railway, built and owned by the Province of Ontario, affords another means of access to this northland. It runs from North Bay to Lake Abitibi, where it will cross the transcontinental railway now under construction, its ultimate terminus being Hudson bay. It touches Lake Temiskaming at Haileybury, so that the traveler can take the boat at Temiskaming and come up the lake to the French Canadian village of Ville Marie, or he can take a boat at Haileybury and go down the lake to this village, and proceeding by a good traveled road, reach the foot of Quinze lake and thence by canoe proceed through a chain of lakes to Opastica. If a steamboat trip is preferred for the entire length of Lake Temiskaming, it can be taken to North Temiskaming, and it was from the northern end of the lake that the writer's party made its start. After a 16-mile tramp over the most abominable road that even 'New Ontario' and 'New Quebec' can offer to the adventurous seeker of riches in these remote districts, we arrived at the landing known as Klock's, a well-tilled farm of 200 acres, with good buildings and stock. A thriving business has been done by these northern agricultural pioneers this summer in supplying the wants of the army of prospectors going into and beyond the 'height of land.' From Klock's the ordinary prospector goes by canoe and a three days' paddle follows; but finding an easier mode of travel, we took passage on a boat, which plies these northern lakes, and is of a species unknown to most boat-builders. A queer sort of craft it is. Were it possessed of life it might be termed batrachian. It is, however, by no means inanimate, and is termed an 'alligator' boat, because it travels by land as well as by water. It is simply a fair-sized scow with paddle-wheels and a haulage-engine, generally used in the lumber country in towing logs. It has a cable and anchor. The anchor is snubbed to a tree and the boat pulls itself along in this way and is capable of crawling over any portage. Quinze lake (called Cass lake by the natives) is 25 miles long, and our boat maintained a speed of seven miles per hour. At the end of the lake came the entrance to Lonely river, up which we ran to the first portage which brought us to a small lake called Obicobo, or Barrier; passing this we traversed another branch of Lonely river for a few miles, which brought us to Opastica lake, at the end of which we pass the 'height of land' (divide). Here we come to height-of-land portage and five miles north of this, on Fortune lake, and 40 miles north of the head of Lake Temiskaming, we found the spot where the great gold discoveries were supposed to have been made.

Once again we found searching for gold as disappointing in the realization, as it had been alluring in anticipation, on the journey up. We found nothing in this particular part of northern New Quebec but a belt of schist in which is a 'blow-out' of quartz, showing no vein-structure whatever, merely a segregation of silica in the schist. The formation consists of quartzite, slate, conglomerate, and schist, of the Middle Huronian, and they show no evidence of disturbance, or igneous intrusion such as would tend to concentrate orebodies. The samples brought down by the original prospectors were never found in this part of the country. Scattered through the adjacent district, and for a radius of 30 square miles, we left possibly 100 prospectors at work, and if any valuable minerals exist there, they will undoubtedly be found before fall.

Crossing into the Province of Ontario, we paddled down to the township of Boston, where we found several men at work. Several promising locations have been staked out. The mining laws here are very different from those of Quebec. The first discoverer plants his discovery post and blazes a trail to the northeast corner of his location, and then goes to the Mining Commissioner and files his application and affidavits of discovery. He then has to go to work on his property, and get it ready for Government inspection. Having passed inspection, he retains his property by doing the required development work. At Boston, two locations have been staked out, one known

as the Grigg, or Mosse-Horn, and the other as the Miller prospect. At the former they have an eight-foot vein of red and white quartz exposed for 300 ft. Gold and silver traces appear 'shot' in the wall-rock, but the result of assays has not yet been received. Several samples have been sent down to the nearest assay-office. Meanwhile the locators have several men at work. Further south, in the Wendigo lake country, it is known that there are several propositions being worked both for gold and silver. There are millions of acres in this northland awaiting the prospector. Here already are many adventurous prospectors, lost in the immensity of the country. There is no railroad as yet, but the entrance of the transcontinental road, and the Temiskaming & Northern Ontario, will afford easy access. With a line running in either direction affording bases of supplies, the natural water-ways will enable the seeker after mineral wealth to enter many regions hitherto unexplored, except by the Indian and an occasional trapper.

At Cobalt many new discoveries are being made, outside of what has hitherto been known as the camp proper. Both up the Montreal river (at Portage Bay), and down three miles from the Kerr and Cross Lake properties, rich finds have been made, which are enlarging the known area of the mineral-bearing zone. Down in Lorraine good finds are being made and the future of the camp is assured. Many expect the output for 1907 will exceed that of any silver camp on the continent. A display of the ores of the Cobalt district will be made at the annual exhibition which opens at Toronto August 27, lasting until September 8. This is the largest annual exhibition in the British Empire. The attendance last year was over 600,000, and the exhibit of ores will include nuggets from all the working and shipping mines.

JOHANNESBURG, July 16.

Why is it that with record outputs, the depression in the Transvaal continues? This is the question heard on all sides. It does seem extraordinary that with a gold production for June worth well over £2,000,000 there should be such a condition of affairs in the Transvaal. Men who have grown gray in the country declare they have never seen a worse state of affairs than exists at present. The suffering and distress in Johannesburg is probably as acute today as it has ever been. The charitable institutions have all they can do. Appeals are made to the public for donations of all sorts. And this in spite of a monthly output of over £2,000,000. The irony of it!

The cause? The feeling of uncertainty that exists all over the country. No one knows what the morrow will bring forth. The Liberal Government has generally brought a blight to South Africa, and the Liberals are in power today and rampant. Their latest move has caused more uncertainty than ever. As is well known, the Liberal Government some time ago caused a poster to be placed in the Chinese compounds, offering the dissatisfied coolies a passage to China. Out of 50,000 coolies about 50 asked to go back. This was a splendid refutation of the lies about slavery and discontent promulgated by the Liberals.

In a spirit of pique, they have signified their determination of putting up yet another poster. The inducements offered the coolies to break their three years' contracts will be most favorable. By contributing a fortnight's pay to his passage money, the coolie will be able to get a trip to China. How will the coolie receive this new poster? It is nearly impossible to prophesy what a Chinaman will do at any time. I am of the opinion, however, that the effect of the new poster will be nearly as contemptible as that of the first. It is now proved beyond the question of a doubt that the coolies are contented with their treatment on the Rand, and are happy here. They begin to realize that the Party at Home are trying to oust them out of the country. When the new poster is stuck up, I predict that the vast majority of the coolies will read it, and then utter the Chinese oaths of disgust. Of course, there will be some of the discontented coolies (generally the 'wasters,') of whom there are 50 or 100 on every mine, who will take advantage of the offer to return to China.

What with the Liberal Party, and the coming political struggle in the Transvaal, the feeling of uncertainty is very acute. Could people know for certain that the country would have peace, that the present excellent results would steadily continue in the future, that ample labor would be forthcoming, then the present depression would vanish in a day. It is because people realize that a large number of the mines will be seriously crippled, if not closed down altogether, by the policies advocated by those in power, and those likely to be in power in the future, that the feeling of apprehension is so great. Once take all the coolies away and try to force white labor onto the mines and you close down the gold producers of the Rand, save the remarkably rich mines of the Central Rand, like the Robinson and Ferreira. The burden of taxation that the mining industry has to bear is very heavy. If half of the mines are closed down the burden on the producing mines will be increased.

The celebrated anti-Chinese Mr. Creswell has opened the campaign against Chinese labor anew. In a speech the other night he referred to the Chinese question as a huge political fraud. Another anti-Chinese advocate opened a campaign against the coolies in Pretoria. These gentlemen are at least earnest, and have not used the absurd slavery cry, which caught so many votes in the recent political struggle in England. Mr. Creswell, while manager of the leading mine, tried white labor extensively, and firmly believes he made it a success. An impartial committee appointed to investigate the matter differed entirely from Mr. Creswell. This gentleman still maintains that white labor would be as economical as coolie or Kaffir labor. But as he is the only mining man of importance in the Transvaal who believes in the doctrine of white labor, the man in the street places his faith in the verdict of the majority.

ROSSLAND, August 12.

Following is the tonnage shipped from and crushed at the mines of Rossland for the week ending August 11: Centre Star, 1,680 tons; Le Roi, 2,610; Le Roi Two, 480. Total, 4,770 tons. Total for the year, 194,399 tons.

At the Trail smelter the work of enlarging the equipment of the Consolidated Mining & Smelting Co. is proceeding steadily. For the week ending Friday, August 10, the following shipments of ore were received besides those sent from Rossland: Snowshoe, Boundary, 409 tons; Iron Mask, Kamloops, 195 tons; St. Eugene, Moyie, 119 tons; North Star, East Kootenay, 109 tons; Providence, Boundary, 65 tons; Snowstorm, Idaho, 26 tons; Lone Bachelor, Slocan, 21 tons.

Boundary ore shipments for the week were as follows: To Granby smelter, from Granby mines, 18,048 tons; Emma mine, 133 tons. To Dominion Copper Co. smelter from Brooklyn-Stemwinder, 2,704 tons; Rawhide, 367; Sunset, 644; Mountain Rose, 39. To Trail smelter, from Providence, 30 tons. To Nelson smelter, from Emma, 330 tons. Total shipments for week, 22,475 tons; total shipments for year to date, 753,150 tons. Boundary smelters this week treated as follows: Granby smelter, 18,250 tons; Dominion Copper Co.'s smelter, 3,754 tons; total treatment to date, 750,354 tons.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

The vein on the Mayflower, John A. Duncan's property two miles southwest of Paradise, has been cut in the adit and is three feet wide. The breast of the adit is more than 400 ft. from the portal. The vein runs in an east-west direction. This strike, which is made on property adjoining the Chiricahua, is one of the best made in the history of the camp and is of much importance.——At the Uncle Sam, owned by Gallen & Warnekros, of Tombstone, operations continue in the adit which has been driven 60 ft. Copper sulphide has been encountered.——On the Bernoudy property, W. P. Wright, one of the owners, is working in the adit on the Elizabeth, the scene of the rich strike.

GRAHAM COUNTY.

(Special Correspondence).—The Arizona Copper Co., at the Longfellow mine, has just completed a 1,300-ft. adit which connects with a 600-ft. shaft, at the top of which is now in course of construction a shaft-house in which is to be installed a hoisting plant. The ore will be dumped into the receiving bins of No. 5 concentrator. In this way three miles of haulage, over steep grades, will be avoided. At the Longfellow surface incline, of this company, to which over 600 ft. has been added at the upper end, bringing it to the same level as the Humboldt, Joy and Clay mines and the No. 5 and 6 concentrators, a winding-drum, 11 ft. diam., has been installed, and engine-house erected, and a new 30-h.p. gasoline engine put in. The old machinery, including brake, engine and drum, have been transferred to the head of the Coronado incline, of this company. On the site of the old boarding-house, there will be erected a 400-h.p. ventilating plant for use in the surrounding mines of this company. Power will be furnished by two 200-h.p. Stirling boilers, the machinery being already on the ground. Since concentrator No. 6, of the Arizona Copper Co., at Longfellow, has commenced operation, it has been found that the storage-ore-bins are too small. Following any stoppage at the crushing plant, the mill is compelled to shut down, owing to lack of ore. It is expected that bins of quadruple capacity will replace those now in use. At the mill recently completed by the Detroit Copper Co., an entirely different plan was followed. The crushed-ore-bins have capacity to hold ore enough to run 12 hours, the crushing plant running only during the day, which arrangement has given satisfaction. At the top of the Joy shaft, on the Humboldt level, the Arizona Copper Co. has completed the foundations for two large ore-bins. The ore cars will run directly from the hoisting cages over the bins from which the ore will be loaded directly into the train.——The hoisting plant of the Shannon Copper Co., at the top of their incline, which was recently entirely destroyed by fire, has been repaired, and is now running full time.——The recent heavy rains caused a large boulder to fall on and break the pipe connecting the Detroit Copper Co. reduction works with their water supply (the Gila river), and caused a few hours shut down.

Morenci, August 11.

CALIFORNIA.

ALPINE COUNTY.

The village of Loope is excited over a find made recently in the Hercules mine, owned by Reno people. In driving an adit to cross-cut the vein an eight-foot vein, previously unknown, and rich in gold and silver, was found at a depth of several hundred feet. The mine was formerly owned by Peter Curtz and was sold several months ago for $100,000. In a few weeks the new company will begin crushing 150 tons daily. As soon as the machinery can be received an electric plant will be installed.

DEL NORTE COUNTY.

(Special Correspondence).—Two companies have lately been formed by local parties. The first, of which D. W. Rice is president, and G. W. Manley is secretary, is to be known as the California & Oregon Assaying & Mining Co. The first object of this company is to maintain a complete assay outfit under competent management, to be of assistance to miners and prospectors in determining the value of their property. Mr. Marlowe, of Haynes Flat and the Doctor Rock, has been active in interesting the business and professional men of Crescent City in this venture, and enough stock has been placed to insure a good start. The outfit has been ordered and arrangements are being made for commencing operations immediately upon its arrival.——W. H. H. McCutcheon, of Myrtle Creek, has induced local parties to form a corporate company for the purpose of carrying on hydraulic operations on Myrtle Creek, which has produced a large amount of gold. The gold in this creek is mostly heavy, nuggets weighing from $2.50 to $40 being not uncommon. One piece, taken out some years ago, weighed $900. The company has engaged John D. Platts to assist in opening and operating the property. Mr. Platts is now making surveys for the hydraulicking plant and the company is preparing to commence work as soon as the surveys are completed.

Crescent City, August 11.

Baker Bros., of Spokane, are driving an adit on their cinnabar mine on Brushy ridge. It is in 250 ft. on ore. This is a low-grade but large property. It has long been known that on Diamond creek, in the northeastern portion of this county, were deposits of cinnabar, but no extensive work has ever been done. Mr. Lacy, of Chicago, has engineers on his Cleopatra copper mines in the Diamond creek district surveying, preparatory to doing annual assessment work. Some rich specimens of copper ore have been taken from the Cleopatra.

INYO COUNTY.

(Special Correspondence).—The Terry Mining Co. is operating a group of promising claims six miles south of Ballarat, where development work has been in progress for more than a year. Good ore was struck at a depth of 50 ft. At the 100-ft. level a cross-cut was driven 130 ft. in quartzite, which assays $3 per ton gold. At the end of this a 50-ft. vein was cut which contains a much better grade of ore, some of it going $10 per ton. This so-called vein is really a dike intersecting the quartzite which is the country rock here. At 400 ft. below the outcrop an adit has been run 600 ft. to again cut this dike. In this adit, 400 ft. in, a 30-ft. vein of good ore was cut. It is thought that the main vein will be reached at 700 ft. There are several smaller veins two to three feet wide intersected by this adit, some of which carry good ore. A mill test is being made on ore from these mines to determine the character of mill and treatment required. A tramway and mill are to be built.

Ballarat, August 9.

(Special Correspondence).—This camp looks good. That is, a great many are expected in here this fall. People have been coming in pretty lively for the last few weeks, but the scarcity of water keeps a good many out at present. Water is now hauled 28 miles from Furnace creek, and is sold by the gallon.

Greenwater, August 11.

The Coso Reduction Co. is concentrating and shipping slag from the old Defiance dump near Darwin. The same company controls the Lucky Jim slag piles. The total amount available for re-working is estimated at 16,000 tons. ——The Garvin Mining & Milling Co., which lately bought the '98 gold mine at Coso, has suspended operations pending the erection of a reduction plant.——J. L. Giroux, after an examination of Chas. Richardson's claims at Darwin, bought them. The company, in which he is the principal stockholder, is known as the Rio Tinto Co. and is opening a claim by that name. On this mine an 82-ft. shaft had been sunk. With the idea of making it two compartments, another shaft was started beside it. Though the first showed little or no ore, the new part is in ore all the way down; the first miners having just missed it. Twelve men are employed.

MODOC COUNTY.

What will be the first quartz mill in Modoc county is on its way from the East. J. M. Layman, manager of the Mines Venture Syndicate, at Fort Bidwell, has made arrangements for the machinery. This company is interested in the newly discovered mining district near Fort Bidwell.

NEVADA COUNTY.

(Special Correspondence).—At the Republic mine, at Graniteville, grading for a 20-stamp mill is in progress and 10 stamps of the mill are on the ground and will be placed at once. The vein is from 10 to 20 ft. thick and is good milling ore. A main adit is being driven, which will make available 400 ft. of backs. Water under a 480-ft. head is the motive power.

Graniteville, August 11.

After more than a year of development work, the adit on the property of the Richard Gold Mining Co. has penetrated the rim of the Manzanita gravel channel, near Nevada City and it is expected gravel will be struck any day. The character of the bedrock has changed materially in the past few days, and the heavy flow of water indicates the proximity of the ancient river bed. This company owns over 7,000 ft. of the channel on Cement hill. Several stockholders from Mansfield, Ohio, recently visited Nevada City.

SHASTA COUNTY.

A 200-ton shipment of copper ore from the Hornet mine, near the Iron Mountain, has been made to Martinez, where the Mountain Copper Co. will work it in the smelter as a test. It is stated that if the test is satisfactory a branch railroad will be run from the company's railroad at Boulder creek to the Hornet mine. The ore was transported on eleven packhorses.

SIERRA COUNTY.

John Hayes, of Sierra City, has bought from J. W. Finney the 20-stamp mill at the Sierra mine on the East Fork, two miles above Downieville. It will be removed to the King Con. mine, near the Marguerite, a short distance below Loganville. This mine is owned by Hayes and others and considerable development has been done on the property, and the owners now feel justified in putting up the mill. The lower adit is in 500 ft. on the vein, and they have about 500 ft. of backs. The vein is five to six feet in width and prospects well.——A rich strike is reported at El Dorado quartz mine on Kanaka creek, near Alleghany. This mine, which has been worked for years, was formerly owned by B. B. Lewis and J. Fessler, and about $75,000 extracted near the surface. Since then a lower adit was run. A few months ago H. L. Johnson, of the Tightner mine, took a bond on the property and put men at work extending this adit and soon struck the pay-shoot.

SISKIYOU COUNTY.

A. C. Brokaw and associates several months ago bonded the Golden Eagle mine to W. P. Hammon of Oroville for $120,000. The bond expired by limitation, the parties failing to agree on the amount of the cash payment. Since then they have uncovered a pay-shoot, and the ore now in sight is said to be worth $300,000.

During the month of July there were filed in the recorder's office mining location notices covering 9,000 acres. A large proportion of the locations made were on copper prospects.

TUOLUMNE COUNTY.

(Special Correspondence).—The new 5-stamp mill on the McDonnell Ranch mine, south of Jamestown, has been started and the results are said to be satisfactory.——Wm. Sharwood has deeded his half interest in the Keltz mine and millsite, Kelvin mine and millsite, north extension of the Keltz mine, and Keltz ditch, 10 miles north of Soulsbyville, to Dudley Baldwin, of Cleveland, Ohio. A half interest in the same properties, and in the Dagmar and Alexander quartz claims, was sold at the same time by Arthur L. Huston to H. L. Huston.——Work is being done on the copper claims owned by Herbert Shaw, J. B. Curtin and others, situated near the summit of the Sierra Nevada in this county, and it is reported that high-grade ore is being found. The discovery of copper in that region was made by Mr. Shaw a year ago, when a large number of claims were located.——It is reported that in the Jumper mine, near Stent, encouraging prospects are being found in the winze being sunk from the 1,400-ft. level.——The rich strike reported made in the Jumper mine some weeks ago was without foundation.

Tuolumne, August 13.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The present activity in mining in Georgetown district exceeds that of any time since 1893. Although the district has always held its own as a producer of high-grade ore, little, if any, outside capital has been invested here until this year. This can, to some extent, be accounted for by the good price now obtainable for zinc and lead ores, many of the old properties here containing large bodies of this class of mineral, which it did not previously pay to mine. The great improvement in the methods of concentration and separation of ore is also a large factor in the increased activity, as the material in the great dumps and the waste in many old stopes can now be treated at such profit that many old mines are again being made to pay handsomely.

There was an increase of 100% in June over May in the amount of ore shipped to the sampling works. The Independent sampling works and concentrating mill of the Santiago Co. are handling several hundred tons of ore monthly, and are far behind with the concentrating ore, the bins all being full and many tons piled outside the mill This company is paying 11c. more per unit for lead than the smelter trust pays.

The Waldorf Co. shipped 600 tons of ore during July, some of which was concentrate, from its mill at Wilcox, East Argentine.——The X-Ray Co., which is working the Doric, Magnet, and Comet groups through the old Doric adit, closed down since 1900, has opened a fine body of concentrating ore on the Cram lode 2,400 ft. in from the portal. At 2,800 ft. in, stoping has been commenced on a streak of smelting ore; the adit is now in 3,009 ft., and will be driven ahead to cut the Comet vein, 2,000 ft. distant.——Resumption of work by the Democrat Mountain Mining & Milling Co., on the old Kelly Tunnel property, is of interest. The company has let a contract for a concentrating mill of 50 tons daily capacity. A tramway 2,000 ft. long is to be built from the mill to the Moline adit. A raise is being put up from the adit level, 220 ft., to the Boston level, where large bodies of lead and zinc ore are blocked out said to be worth $16 per ton. Sufficient ore to keep the mill running two years is in sight.

The Griffith Mines Co., owner of the East Griffith mine, which was the first location in the district, has let a contract for a mill similar to that of the Democrat Mountain Co. There are large bodies of lead ore containing silver, zinc, and copper, opened up in the extensive old workings. This property has been idle for five years.

Georgetown, August 11.

DOLORES COUNTY.

The principal orebody underlying the town of Rico is being mined from under its streets and alleys through the Atlantic Cable shaft by the United Mines Co., from another portion of the company's property, the Black Hawk group; shipments are being made under contract to Colorado smelters, and also to the Missouri and Kansas zinc smelters. From another part of this property, the Grand View, high-grade zinc sulphide is being mined.

LAKE COUNTY.

In South Evans gulch, Leadville, with few exceptions, all the mines are shipping. The rich ore lately encountered in the Winnie holds out; it has now been opened for over 200 ft. and the ore assays the entire length from 50 to 56 oz. per ton. The Enterprise people are driving on the 200-ft. level, but have not yet found the ore. The Silver Nugget shaft has been unwatered, and is being sunk. On the Gnome ground, adjoining the Izzard, work has begun. At the Ella steady shipments of 50 tons daily are being sent to the smelter. The ore is sulphide carrying gold. The lessees on the St. Louis are also shipping steadily, the ore running $30 per ton.——The refusal of the Pueblo smelters to buy more manganese ore before October 1, is working a hardship on some lessees who were sending out that class of ore.——The Morning and Evening Star, on Carbonate hill, continue to output about 400 tons daily of argentiferous iron and some lead carbonates. Not a shaft belonging to the consolidation is idle. John Lynch is sinking a new shaft near the

old Morning Star and is down 65 ft. He expects to go about 150 ft. before driving to the orebody. Nels Lind is employing eight men and is driving from the 400-ft. level and shipping 100 tons per week.——Sixteen men are at work on the upper Waterloo shaft and taking out a car of ore daily while prospecting.——Recent development in the Helena, on Iowa gulch, shows that the ore carries 2 oz. gold per ton, in addition to the silver and lead. It is unusual to find gold in such quantities in this part of the gulch. The work on the new orebody is being pushed and Mr. Brenneman, the manager, thinks he has caught the main ore-shoot.

SUMMIT COUNTY.

(Special Correspondence).—Frisco is unusually active just now; not only the new but also the old companies, which have for some time been indifferent in their operation, are hustling and making the camp lively.——The King Solomon is operating and steadily pushing the main adit into Mt. Royal with machine-drills. The management is securing more territory, including some well situated ground on Miner's creek. The surveyors have just completed their field work.——The Mint Mining & Milling Co., operating in Ophir mountain, is working two shifts. The adit recently passed through a good vein.——Heckman's Eureka, situated below the Victoria mine on Royal mountain, has produced some rich float, which has ranged as high as $3,700 per ton gold. An adit 260 ft. long has been run through the surface debris by the owners, Heckman & Linquist, and they are now coming into solid schist, the characteristic formation of the mountain.——The property on the east of the Victoria, which latter was worked for a long time by Albert Newton, has been taken over by a Denver company, with Mr. Colburn at the head of affairs.——The Square Deal has established a model camp at the foot of Chief mountain, on the North Ten-Mile canyon. A good water supply is piped from a nearby gulch, all through the camp, for domestic and fire purposes. Work is confined to driving the main adit, which is now in 125 ft. The Mary Verna Co.'s main adit is in 1,105 ft. and the formation is changing for the better, a sprinkling of copper and iron pyrite showing in the rock.——The North American has its main adit in 1,300 ft. headed for a point beneath the apex of Peak 1. The work is now approaching the Michigan vein.——The Boltz property, on Peak 1, has been signed over, under bond and lease, to the Southwestern Brokerage & Investment Co., of Memphis, Tennessee.——Martin Hartman, an old-time prospector and miner of Summit county, has located some claims on Slate creek, 20 miles below Dillon. He claims to have an outcrop several feet wide, carrying from $5 to $12 per ton gold and 50 oz. silver, and the rock is heavy in iron sulphide.——The placer mining operations at Breckenridge are giving excellent returns. The water supply is still adequate, the unusual intermittent rains having aided greatly.——The Colorado Consolidated Mining & Exploration Co. has been sluicing in the vicinity of the Gold Pan pit, in the Blue river, and its first clean-up for this season exceeded expectations.——The Mecca Co.'s ground-sluice is fast approaching the old Oro Grande pit and the work is now on bedrock.——At the Summit Banner, in Iowa gulch, sluicing continues to uncover boulders of rich gold-bearing quartzite. This property, it is thought, may develop into a lode-mining property.——The Reliance Dredging Co., in cleaning up the Reliance dredge lately, found a large piece of zinc ore carrying free gold.——The old Union Co. has completed its connection by raise from the main adit to the old workings, and 85 ft. of it is on a 5-ft. vein of concentrating ore. The Gold Dust-Puzzle combination is now being worked. The electric pump and hoist have been installed and are driven by power from the Colorado Consolidated Mining & Milling Co.'s works, at Breckenridge. The Blue Flag, now operating the Laurium mine on Bald mountain, has completed the addition to its mill. J. F. Eisman, president of the company, was up from Denver last week looking over the property.——The Bay State Mining Co. is operating on North Star mountain under management of Arthur Howard. A strike of high-grade copper-gold ore was made last week. The ore assays $150 per ton. A new lower adit is being started.——The Nebraska Co. is a new corporation formed by B. B. Green and others, of Nebraska, and is operating a group of claims on the east side of the North Star mountain, not far from the Atlantic mine. At the Atlantic, regular shipments of high-grade gold ore are being made to the Denver smelters.

Breckenridge, August 11.

IDAHO.

LEMHI COUNTY.

It is reported from Prairie basin that a Placer miner, Eli Minert, has traced cassiterite float up Big creek to its head and has found dikes containing tinstone in place. The float was followed more than three miles.——E. M. Burton reports a big strike of gold made on the Wahn property on War Eagle mountain.

WASHINGTON COUNTY.

A. Griswold says gold-bearing ore has recently been found in a mine of the Goodenough Mining & Milling Co. at Marshall lake A five-stamp mill is now being installed.

MONTANA.

LEWIS AND CLARK COUNTY

The Circuit Court of Appeals has affirmed the judgment of the Federal Court in the case of the St. Louis Mining Co. against the Montana Mining & Milling Co. (Drum Lummon mine at Marysville). The lower court gave the plaintiff a verdict of $195,000, the value of ore extracted from the vein in dispute. The costs of the suit will bring the sum up to $223,000, which the Montana Mining & Milling Co. must pay The verdict is said to be the largest ever obtained in a court in Montana.

NEVADA.

CHURCHILL COUNTY.

As soon as the best method of treating the ores of Eastgate has been determined several of the operators of that camp propose to erect a suitable mill. This plant will probably be the first to be built in the new camps of this county.

DOUGLAS COUNTY.

It is reported at Carson that the Mammoth mine, 25 miles south of that city, in the lower portion of the Pinenut range, is to be developed by the Alaska-Treadwell Mining Co., which recently purchased it from F. B. Livingston. The company has completed its plans, and a large electric generating-station will be built with which to operate a stamp-mill. The ore in the Mammoth is low grade. Already a large amount has been blocked out. Several hundred men will be employed.

LINCOLN COUNTY.

(Special Correspondence).—An effort is being made to organize a board of trade in Searchlight.——The Searchlight Co., of San Bernardino, has purchased the Confidence claims from A. L. Heydloff and A. H. Smith. It is reported that, following up a recent strike on the Confidence, ore that runs $70 per ton is being mined.——The recent consolidation of the Providence Exploration Co. and the Juniper and Chiquita groups, situated in this district, under the name of the Chiquita Con. Mining Co., brings together over 50 claims, with an aggregate area of about 1,000 acres. E. J. Knight is president and general manager; Everard Holmes, secretary; and H. S. Peck, treasurer; with headquarters at Searchlight. Arrangements are being made for the purchase of machinery. A short time ago a strike was made on the Chiquita group, from which shipments of high-grade ore are now being made to the Needles smelter.——Edward Carleson, of the Wyoming-Searchlight, has returned from Salt Lake City, where he organized a company and secured capital to proceed with the development of the property. The shaft is now down 200 ft. Contracts have been let for surface improvements, and the shaft will be straightened and re-timbered.——George Bergman has sold the Georgia Con. group to H. J. Dull, of Los Angeles, for $50,000, of which $5,000 was paid down. This property consists of eight claims, situated in El Dorado canyon one mile east of the Techaticup. Little development work has been done, although Mr. Bergman states that the examining engineers took 114 samples which assayed an average of $14 per ton gold and silver. Water for camp purposes has been developed at a depth of 15 ft.——In cutting a hitch in the hanging wall of the Venus shaft, the rock was found to be ore, and further investigation disclosed 16 in. of high-grade ore entirely outside of the line of the shaft. The shaft is all in

ore and the vein is widening with depth. Recent assays taken from the bottom averaged nearly $100 per ton, mostly gold.——New machinery has been installed in the El Dorado mine and development will now be accelerated.——The rich ore from the adit of the Chippewa is being prepared for shipment to smelter, a trial shipment having returned satisfactory results. Arrangements have been made to ship several carloads.——The Eldorado-Bonanza Mining Co. has been organized to take over a group of claims lying east of the Black Hawk Co.'s property. Little development work has been done so far; the ground is being prospected to determine the best place to sink the shaft.——From the 100-ft. level of the Cyrus Noble Extension driving is in progress north and south on a vein of decomposed porphyry three feet thick which carries gold and silver. This is the second vein encountered in sinking the shaft; the first, about 10 ft. thick, was 50 ft. from the surface, and there is another on the foot-wall for which cross-cuts will be started when the drifts are 50 ft. from the shaft. The richest ore is found on the foot-wall.

Searchlight, August 11.

WHITE PINE COUNTY.

It is reported that the Calumet & Hecla Mining Co. has bought 22 copper claims at Ely, adjoining the most important mines of the district.

OREGON.

JACKSON COUNTY.

At the Blue Ledge copper mine, near Grants Pass, 150 men are employed on development work. The compressor has been operated by steam, but electric power is to be installed. The Blue Ledge Co. lately bought the large holdings of the Seattle Mining Co. on Applegate river, near the mouth of Elliott creek, an ideal site for a smelter, and with it is a ditch giving a head of 150 ft., which will afford all the power needed at both the smelter and the mines. The company now has a force repairing the ditch, and putting up a building for the electric plant. It is expected to have it in operation in 60 days, and wires strung to the mines to supply power for compressors and for light. The Blue Ledge mines are in the foothills of the Siskiyou mountains and six miles from the smelter-site. The mines are just over the line in California, but the smelter will be in Oregon.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Homestake Co.'s new slime-plant, at Deadwood, is practically completed. It is thought the plant can be put in operation in October. It will be the largest and most modern of the kind in the world. About 40% of the tailing from the stamp-mills is slime. The remaining 60% (the sand) is treated in the two cyanide mills, one at Lead, the other at Central, with a combined daily capacity of 2,400 tons. The Homestake saves 75% of the assay value of its ore on the plates in the mills; the two sand-plants save 15%, and the new slime-plant will add 5%, making a total extraction of 95%. The estimated cost of this plant is $400,000. The value of the slime is about $1 per ton. The slime will be brought in iron pipes from the mills, and be treated by filter-presses. The chief difficulty which has confronted this process has been the cost of discharging the presses after the gold has been recovered. This trouble has been largely done away with by an automatic sluicing device invented and patented by C. W. Merrill of the Homestake, which makes it unnecessary to open a press except at long intervals. Twenty-four filter-presses, weighing 60 tons each, will be installed. The slime from 1,000 stamps in the mills comes in iron pipe-lines directly into the upper building, where two storage-tanks receive it and where the necessary lime is added. A pipe connects the sludge tanks with the filter-presses in the main building. A precipitating-room, a solution-storage building and a water-storage tank are among the annexes of the plant, which is also provided with an assay office. Electric power will be used.

PENNINGTON COUNTY.

(Special Correspondence).—The situation of the tin interests in the Black Hills may be briefly stated as follows: For several months past there has been a good deal of talk about tin and mica in this district and there have been many announcements of sales which were about to take place but there have been no recent deals consummated. Nevertheless, it is not all smoke, and mining men, and the community generally, are on the tiptoe of expectation that a number of deals in both mica and tin will culminate soon. The Gertie mine, near Hill City, with a shaft down 500 ft., and drifts run each way on the vein, has disclosed the fact that there is good tin ore all the way down; the drifts show a large body of ore, and with a little mill it has been demonstrated that this ore can be mined and milled at a handsome profit. The new mill is fast nearing completion and is expected to be running in about a month. Some new machinery passed through Custer for the new plant, which will have 50 tons daily capacity, and will be equipped with the best modern appliances for the saving of tinstone. This new machinery consisted of two sets of rolls and one large Sturtevant crusher. They have all the men at work in the mine that can be employed to advantage, and everyone expects that the Gertie will be a success. M. L. Boyer is superintendent.

Frank Hebert is mining tin ore at his mine a few miles east of Oreville, and 10 miles northeast of Custer, and is crushing it in his two-stamp Tremaine mill. He has a 6-ft. vein of tin ore and is making an excellent showing by crushing and concentrating on a Wilfley table and shipping the concentrate East for treatment. These are the only two plants in operation at present in the Black Hills that are actually producing tin. It is reported that the Tinton Mining Co., on Bear gulch, near Nigger hill in Lawrence county, has re-organized and will soon start the mill. It is also currently reported that the old Harney Peak Tin Co., which operated in this district 16 years ago, will re-organize and work the tin mines owned by the company, amounting to about 2,000 acres of mineral ground, a good portion of which is patented. However desirable this may be, it is possible that the announcement was made prematurely. We only know at present that the attorney for the company, E. Van Cise, is in London for the purpose of bringing about the reconciliation of the London and New York stock holders, that they may unite and work their tin mines in the Black Hills on a scale commensurate with their magnitude and importance. Before the English invested largely in the mines they were examined and tested and the reports were said to be, without exception, favorable. The old tin captains of Cornwall, Vincent, Jackson, Thomas, and others, all declared that the veins were larger, the tinstone purer than those of Cornwall, and that they could be made profitable, and this at a time when tin was not half as high as today. There is a good deal of interest taken in tin just now, and many of the abandoned mines are being overhauled and developed in the tin districts of Pennington county.

Custer, August 8.

UTAH.

BOXELDER COUNTY.

A strike is reported made in the Louise Con. mines, three miles north of Willard. Fred Hillman, of Ogden, is president of the company. The adit had caved and it was in the process of cleaning up and re-timbering that the new vein was found. There are 10 ft. of high-grade copper ore.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Winnipeg Mining Co. has constructed an ore-bin at the Belcher Mountain railway track 600 ft. from its lower adit, in which it is reported ore has been struck.——The Belcher Mining Co. has started a new cross-cut adit below No. 3. An aerial tramway is planned. The electric fan has been removed to the lower adit. The company employs 12 men. It may be another year before any ore is shipped from this property.——Work has again been suspended at the San Poil mine, where W. H. Crummer, the lessee, has broken 200 tons of ore for shipment, but for which there is no present market.——The Umatilla mine, situated one and one-half miles west of Keller, on the south half of the Colville Indian reservation, is to be re-opened. The last work done was the driving of

an adit 750 ft. which cut a vein of copper ore. It is now proposed to develop this vein.

Republic, August 4.

OKANOGAN COUNTY.

(Special Correspondence).—A. M. Dewey, manager of the Q. S. Gold Mining & Smelting Co., is making arrangements for the site of the power-plant. The company has 100,000 ft. of logs and has contracted for a sawmill, to cut 15,000 ft. of lumber per day. The company has also closed a contract for an electrical lighting and power-plant of 200 h.p. Work on a pole-line and the construction of a ditch and dam will be started immediately. The adit has passed through 128 ft. of ore. The days' paymen have been discharged, and a contract let to drive the adit an additional 100 ft. to be finished by September 20. Mr. Dewey reports that a new 2,000-ft. adit is under consideration to cut the vein at a depth of 1,200 ft. The surface shows a number of small but rich quartz veins.——The Polepick Mining Co. has reorganized and will work on the Polepick mine, in the Twisp district.——The Poland-China mine, at Chesaw, has been bonded to an Eastern syndicate for $10,000. The Lost Canyon mine, owned by E. P. Gailliac, has been sold to a company of Ohio and Indiana men for $10,200. The purchasers have since bonded the Grant and three other claims adjoining, all situated in Beaver canyon.——The York Mining Co. will start up its mill in a few days. This was formerly known as the Bodie mine, of Bodie Camp.

Republic, August 11.

WYOMING.

BIG HORN COUNTY.

Mark Hirsch, superintendent of the Imperial Mining Co. of Deadwood, South Dakota, says Kirwin, is one of the best mining camps he has ever visited. The mines produce ore rich in gold, silver, copper and lead, occurring in fissure veins in width up to 30 ft. and traceable for thousands of feet along their outcrop. Even though 60 miles from a railroad, a great deal of work is being done. The Galena Ridge Co. has spent nearly $400,000, and has most encouraging developments.

CANADA.

YUKON TERRITORY.

(Special Correspondence).—What is known as the White Channel in this region is an immense deposit of quartz-gravel. It is washed and ranges from fine sand to cobbles weighing 25 to 30 lb. The most of the material is quartz, besides which there is mica-schist, quartz-schist, and smaller amounts of altered quartz-porphyry, quartzite and limestone. The extent of this deposit is not yet known. It strikes through the country in an east-west direction for 12 miles or more, and is from 1,000 to 4,000 ft. wide. In some places it is covered by 'wash' from higher mountains, in others it is cut by waterways, its bedrock being 100 to 300 ft. above creeks. The workings of these gravels have been confined to small operations by drift mining, no water being available for hydraulicking on a large scale. It has been generally thought that hydraulicking was the only method of working these gravels, but the examination by Mr. A. Sydney Additon has shown that a higher recovery of gold can be made by milling and cyaniding than by hydraulicking. The gold in this gravel is of three kinds: (1) placer gold which can be recovered by hydraulicking; (2) fine gold which cannot be recovered by hydraulicking; (3) gold in the quartz boulders. The second class is most abundant. The presence of the second and third kinds makes it impossible to mine the entire deposit from bedrock to surface and mill it at a profit. The first class is confined to 8 to 10-ft. bedrock. The testing of this gravel has been done in five-ton lots, with a two-stamp mill and a five-ton cyanide plant. The samples were carefully taken, so that each represented the entire depth of the deposit. The results secured are such that the installation of a large mill is assured. This mill in operation, and the proposition more thoroughly demonstrated, other mills will follow. There are millions of tons of this material ready to be delivered to the mill. An estimate, based upon actual returns from gravel milled, shows 60c. to $1.25 per ton profit treating 1,000 tons per day. The ground, however, is not all dike. Some will not pay, but 80% of all the samples milled would pay. Dawson is no longer the camp for the individual miner. The creek claims, which have produced millions of dollars, no longer contain pay that can be recovered by former methods. The time of dredgers and large hydraulic plants is at hand. Large corporations are securing ground for such operations. Water in large quantities and electric power are being made available.

Dawson, July 15.

MEXICO.

GUANAJUATO.

(Special Correspondence).—A contract has just been concluded between the Mexican Central Railroad and the firm of J. J. Moylan & Co. for the building of a connecting railway from Marfil to Guanajuato. The contract is said to have been effected at $400,000, exclusive of terminal stations.——The Guanajuato Power & Electric Co. is now closing up a deal to acquire further water-power, which will enable it to increase the distribution to 16,000 h.p. It now supplies about 6,000 h.p. In Guanajuato it will distribute about 650 h.p. to the Guanajuato Consolidated Mining & Milling Co., 650 h.p. to the Guanajuato Amalgamated Gold Mines Co., 600 h.p. to the Guanajuato Mines & Reduction Co., 1,000 h.p. to the Peregrina Mining & Milling Co. The above will be its largest individual customers.——The Guanajuato Mines & Reduction Co. will almost immediately set about increasing its present 80-stamp mill to 160 stamps, with commensurate cyanide plant.——The Guanajuato Amalgamated Gold Mines Co. will complete its 100-stamp mill and cyanide works, designed by V. B. Sherrod, about October of this year. It has also built a dam having a capacity of about 70,000,000 gal. for private use.——El Cubo property is under option to London capital.——In the Guanajuato district there are a number of small mills, as well as the larger ones afore-mentioned, under construction, namely: Nayal 20 stamps, San Prospero Mining & Milling Co. 40 stamps, La Central 10 stamps. The Guanajuato Development Co. has in the Pinguico mine one of the best paying properties in the whole camp. This mine has been earning over $3,000 net per week for some months past.

Guanajuato, August 1.

(Special Correspondence).—The Dwight Furness Co., of this city, has entered into a contract with the Guanajuato Reduction & Mines Co. for the purchase of the products of the company's plants at Bustos and Flores.——Work on the 100-stamp mill of the Peregrina Mining & Milling Co. is being rushed. Forty of the 100 stamps will be dropping in a few days, and it is expected to have the remaining 60 in operation early in September. Good progress is being made on the 100-stamp mill of the Guanajuato Amalgamated Gold Mines Co. at La Luz, and it is expected to have the 100 stamps dropping by November 1.——The Guanajuato Reduction & Mines Co. has its tube-mill, for regrinding the ore, in operation, and is now treating 250 tons of ore daily, with splendid results. The unwatering of the mines is in progress.——Frank G. Peck, of Colorado Springs, is completing a 40-stamp mill for the handling of the ore of the San Prospero mine, of which he is the sole owner.——The Cabrestante Mining & Milling Co. has been organized in Chicago for the purpose of working the Cabrestante mine in the Nayal camp. John Kniskern and George Knapp, of Chicago, are the leading men in the new company, and the Dwight Furness Co., of this city, is largely interested with them. F. H. Hobson will have charge of the work at the mine.——The 15-stamp mill of the American Mining & Milling Co. has been running for a month with good results. The Inglesa mine, owned by the company, is producing a fine grade of milling ore, and also a big percentage of ore of shipping value. J. C. Corwin is manager of the company.——Twenty stamps are dropping at the Nayal custom mill, and the plant is doing good work for the Nayal camp. Now that an outlet for the ores has been provided, a number of mines in the camp have started active work.——The Cubo mines, which have been worked for a year past under an option by T. H. Leggett, have been returned to Cubo Mining & Milling Co., of Chicago. The company proposes to continue active development work. Gerald Rives continues as manager.

Guanajuato, August 9.

Personal.

WALDEMAR LINDGREN is at Denver.

JOHN KINKEAD is at Goldfield, Nevada.

EDGAR NEWHOUSE has returned to New York.

J. N. ESSELSTYN is now at 2536 Piedmont Ave., Berkeley.

GEORGE D. BLOOD of Salt Lake City is now at Dayton, Nevada.

GEORGE E. TILLY is manager of the Sucre gold mines, in Colombia.

J. R. FINLAY has returned to Colorado Springs from New York.

R. GILMAN BROWN has his office now at 1537 Bush St., San Francisco.

JAMES A. RICKARD is mine manager in the Aude department, France.

ERNEST W. BYRD has returned to London from Tarkwa, in West Africa.

F. L. SIZER has been appointed manager of the Gould Mines Co. of Montana.

PHILIP WISEMAN, of Los Angeles, is examining mines near Prescott, Arizona.

PERCY B. WESTON is on his way to Patagonia to direct gold-dredging operations.

H. W. TURNER is examining mines at Pine, Oregon, assisted by J. H. HARTLEY.

THOS. CARROLL is superintendent of the Saginaw Mining Co. at Custer, South Dakota.

M. L. BOYER is superintendent of the Gertie tin mine, near Hill City, South Dakota.

D'ARCY WEATHERBE has accepted an appointment with Phelps, Dodge & Co. at Bisbee.

J. A. DRYDEN has been appointed manager of the Pinkham mine, at Chloride, Arizona.

C. W. PURINGTON is at Eureka, Colo., examining mining property in the San Juan district.

RENSSELAER H. TOLL has moved his headquarters from Mancos to Cripple Creek, Colorado.

E. J. KNIGHT is manager of the property of the Chiquita Con. Mining Co., at Searchlight, Nevada.

C. M. FUELLER has been engaged professionally at the Dives-Pelican mill, Silver Plume, Colorado.

E. J. KENNEDY is manager of the Golden West mine, on Castle creek, near Rochford, South Dakota.

WILLIAM GARRISON has left Cananea, to become foreman at the La Dicha smelter, in Durango, Mexico.

HENRY J. GIFFORD has been appointed superintendent of the Champion Reef mine, in Mysore, India.

EMERSON GEE has returned to Los Angeles from mine examinations in the Blue River district of Oregon.

F. W. BOCK has gone from Rochford, South Dakota, to his mines in the Warren Peak region of Wyoming.

J. F. EISMAN of Denver has been inspecting mines in which he is interested at Breckenridge, Colorado.

HORACE G. NICHOLS, manager of El Transito and Porvenir mines, in Nicaragua, is on his way to London.

C. W. WHITLEY, manager of the Garfield smelter, has returned to Salt Lake City from a visit to San Francisco.

C. O'BRIEN has gone to La Cunibre, Sinaloa, Mexico, to take charge of the mill of the Galanista Mining Company.

JESSE A. STEWART has accepted a position as mining engineer with the De Lamar Co., Ltd., at De Lamar, Idaho.

G. C. HEWETT has returned to Colorado Springs from the San Juan region, where he has been examining several mines.

EDWIN W. MILLS has resigned as assistant superintendent of the Oriental Consolidated Mining Co., Chemulpo, to become superintendent of the Chiksan mines, also in Korea.

JOSEPH IRVING has been appointed superintendent of the Continental Smelting & Refining Co., at Ironton, Colorado.

THOMAS MCCORMICK has been appointed superintendent of the Con. Virginia and California mines, at Virginia City, Nevada.

E. C. THURSTON, of the Empire Zinc Co., Canyon City, Colo., has been examining zinc mines on Arrow lakes, British Columbia.

HENRY ARGALL, the oldest son of PHILIP ARGALL, was married on August 3, at Martinez. He is metallurgist at the Selby smelter.

JOHN D. PLATTS is making surveys and plans for the installation of a large hydraulic plant on Myrtle creek, Del Norte Co., California.

J. BOYD AARONS is now manager of the consolidation of the White Feather Reward & White Feather Main Reef mines, Western Australia.

R. H. SUTTON is superintendent of the Copper World mine, for the Cocopah Copper Co., at Ivanpah, in San Bernardino county, California.

CLERMONT LIVINGSTON is general manager of the Tyee Copper Co. and recently received the thanks of the shareholders for his able services.

H. S. KENNEDY has resigned the management of the Lakeview Dredging Co., at Neeley, Idaho, and will leave Butte, Mont., shortly for Johannesburg, South Africa.

G. C. KLUG, who recently resigned as resident manager of the Gt. Boulder Perseverance mine, has become manager of the Phillips River gold and copper mines at Ravensthorpe, also in Western Australia.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, August 15.

Con. Virginia	$0.89	Jumbo	$1.47
Ophir	3.45	Manhattan Con	1.25
Savage	0.90	Mexican	0.74
Tonopah	18.12	Midway	2.30
Belmont	5.37	Mohawk	3.75
Jim Butler	1.45	Red Top	1.60

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 9. £ s. d.	August 16. £ s. d.
Camp Bird	1 4 6	1 5 0
El Oro	1 10 0	1 9 4½
Esperanza	3 1 6	3 5 0
Dolores	2 1 3	2 0 0
Oroville Dredging	0 16 3	0 16 3
Stratton's Independence	0 4 0	0 3 9
Tomboy	1 3 9	1 4 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 9.	Average Prices for Week Ending August 16.
Copper—Lake (cents per lb)	18⅜ @18¼	18⅜ @18¾
" Electrolytic "	18⅝16 @18⅜	18⅝16 @18⅝
" Casting "	18 @18⅛	18 @18⅛
Lead "	5.75	5.75
Spelter "	6.025	6.025
Silver (cents per oz.)	65⅛	66¼

CURB QUOTATIONS—NEW YORK.

	Prices for August 9.	Prices for August 16.
Bingham Central	2⅛	2
Boston Copper	25⅞	26⅞
Calumet & Arizona	16½	16½
Cumberland Ely	7⅜	7½
Dolores	9⅜	9½
El Rayo	4⅞	4⅞
Guanajuato Con	5¼	5⅜
Giroux Con	7½	7⅜
Greene Con	25	24⅞
Nevada Con	18⅛	18⅛
Nipissing	5⅛	6
Tennessee Copper	46	45⅜
Tonopah Ex	5⅜	5⅜
Tonopah-Belmont	4.90	4.90
Tonopah	18⅜	18¼
United Copper	63	63¾
Utah Copper	27½	27

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

A MODIFICATION of the caving system of mining is being introduced at the Cananea mines.

CHROMITE generally occurs in serpentine. The poorer ore scattered in the serpentine can be concentrated to a high-grade product without trouble. A rude concentration can be made by sluicing.

COVER-GLASSES for microscope slides sometimes appear dingy and it seems impossible to clean them. This may be easily done with a weak solution of sulphuric acid, when water, alcohol, rouge and other things fail to give the desired results.

A TEST of tube-mills for treatment of diamond-bearing rock is being made at the gold mill of the Village Main Reef mine at Johannesburg, Transvaal. The diamondiferous ground came from the Pretoria mines—the test run being 1,000 loads.

A PATENT has recently been issued in the United States for a method of desilverizing lead bullion, the process being in the addition of metallic zinc to the molten bullion, and then adding sal-ammoniac to cause a more complete separation of lead and silver.

THE Seattle, Wash., assay office reports its gold receipts for the first half of 1906 as $20,000,000, of which about $7,000,000 came from the Tanana district, $5,000,000 from Nome district, and the balance from other parts of Alaska, Yukon basin and from the Pacific Northwest.

PASSENGER ELEVATORS in buildings seldom run at a speed exceeding 800 ft. per min., and the greater number run below 500 ft. per min. A mine cage or skip running at this speed is considered slow. Maximum speed in mines ranges from 2,000 to 6,000 ft. per minute.

THE metre is the unit of length of the metric system of weights and measures, and was intended to represent the one ten-millionth of the quadrant of the earth, measured on a meridian from either pole to the equator. The gram is the unit of weight which is the weight of a cubic centimetre of pure water at its greatest density—4.5 deg. C. or 40 deg. F. The latitude is a negligible factor.

YELLOW OCHRE is used in the manufacture of oilcloth and linoleum, and to a small extent in the manufacture of paint. The calcined ochre makes a dark red pigment. Yellow ochre occurs commonly in quartzite, particularly the Cambrian. It is abundant at Cartersville, Ga., and is common in some portions of Colorado and in the Black hills of South Dakota. At Red Cliff, Colo., and in the Bald Mountain district of the Black hills, these ochre deposits carry gold in payable amount.

IN 1880 the annual gold production of the world was about $100,000,000, and that of the United States was about $30,000,000. In 1900 the world's gold production had increased to nearly $300,000,000, and that of the United States to nearly $80,000,000. No one can predict what the future output of gold will be. Important factors in production are the discovery of new gold districts, the development in old districts of new orebodies carrying gold, and more than either of these is the introduction of processes which makes the treatment of low-grade ore and tailing profitable. At present, dredging is also an important and increasing factor.

THERE are now in successful operation in Butte three blast-furnaces each 52 ft. long, and one of them is being enlarged to 89 ft. There seems little doubt that this large furnace will prove as successful as those of only a little over half this length. What the ultimate economic limit in size of a copper blast-furnace will be, it seems impossible to say.

THE Niagara, Lockport & Ontario Power Co. has planned to transmit electric power with aluminum cables from Niagara to Syracuse, N. Y., a distance of 160 miles, and is considering a line to Cleveland, O., a distance of 200 miles. The Niagara and Syracuse line is partially finished. Many miles of aluminum line are in successful use as a carrier of electric current in California.

MINERAL VEINS exist in rocks of every geological age, but are most numerous in regions consisting of sedimentary rocks intruded by igneous rocks, though regions in which only igneous rocks occur also often contain many mineral veins. Although veins occur in metamorphic sedimentary rocks, unaccompanied by intrusive rocks of any kind, largely profitable mines in veins of this class are not abundant.

COPPER, after converting, always contains copper oxide which must be reduced to metallic copper. This is accomplished by what is known as 'poling.' For this purpose a large long pole of green wood, of any kind, is introduced into the refining furnace, which being burned in the metallic bath, results in the evolution of a large amount of hydro-carbons and other reducing gases, the presence of which quickly changes the copper oxide to metal. The poling, according to Peters, is continued for about 60 min., or until a full-sized ingot (on being poured) shows no contraction or depression on cooling, and the texture is fibrous and silky.

A SIPHON practically ceases to be effective at a depth greater than 28 ft. at the sea level, and the apparatus must be nearly perfect to operate satisfactorily to that depth. As the altitude above sea level increases the depth to which the siphon will operate becomes correspondingly less, owing to decreasing atmospheric pressure. The lower end of the outer limb of the siphon must be lower than the surface of the water, or it will not work at all. In Beaver Head county, Mont., it is probable that a siphon will not operate to a greater depth than 18 ft. vertical, therefore, it would not be an economical or sensible idea to attempt to install a siphon with a pipe line over 2,000 ft. long to raise a small amount of water from a maximum depth of 18 ft. Rubber hose suitable for such purpose would cost at least 12½c. per ft., making the outlay for hose about $250, and a leak would probably end its usefulness as a siphon. The cost of iron pipe 1¼ in. diam. at the mine in question is unknown to us, but is probably not less than that of the hose when in position in the mine. The suggestion to operate a gas-engine of any description 2,000 ft. from the portal of an adit cannot be given a moment's consideration. The best theng to do is to operate an electrically driven pump in the shaft, and the next best is to place an air compressor at the mouth of the adit and run a pipe line to the face and down the shaft to a sinking-pump. Both of these propositions are feasible. A third method is by means of the hydraulic lift or ejector. This requires a relatively large volume of water, under high head, to discharge a small amount of water to comparatively limited height. In a small plant, of this description, there is danger of the ejector becoming clogged with small debris from the sump. The electric pump is probably the best of the several means of handling the water. It is direct, efficient, and not an experiment.

Personal.

WALDEMAR LINDGREN is at Denver.

JOHN KINKEAD is at Goldfield, Nevada.

EDGAR NEWHOUSE has returned to New York.

J. N. ESSELSTYN is now at 2536 Piedmont Ave., Berkeley.

GEORGE D. BLOOD of Salt Lake City is now at Dayton, Nevada.

GEORGE E. TILLY is manager of the Sucre gold mines, in Colombia.

J. R. FINLAY has returned to Colorado Springs from New York.

R. GILMAN BROWN has his office now at 1537 Bush St., San Francisco.

JAMES A. RICKARD is mine manager in the Aude department, France.

ERNEST W. BYRD has returned to London from Tarkwa, in West Africa.

F. L. SIZER has been appointed manager of the Gould Mines Co. of Montana.

PHILIP WISEMAN, of Los Angeles, is examining mines near Prescott, Arizona.

PERCY B. WESTON is on his way to Patagonia to direct gold-dredging operations.

H. W. TURNER is examining mines at Pine, Oregon, assisted by J. H. HARTLEY.

THOS. CARROLL is superintendent of the Saginaw Mining Co. at Custer, South Dakota.

M. L. BOYER is superintendent of the Gertie tin mine, near Hill City, South Dakota.

D'ARCY WEATHERBE has accepted an appointment with Phelps, Dodge & Co. at Bisbee.

J. A. DRYDEN has been appointed manager of the Pinkham mine, at Chloride, Arizona.

C. W. PURINGTON is at Eureka, Colo., examining mining property in the San Juan district.

RENSSELAER H. TOLL has moved his headquarters from Mancos to Cripple Creek, Colorado.

E. J. KNIGHT is manager of the property of the Chiquita Con. Mining Co., at Searchlight, Nevada.

C. M. FUELLER has been engaged professionally at the Dives-Pelican mill, Silver Plume, Colorado.

E. J. KENNEDY is manager of the Golden West mine, on Castle creek, near Rochford, South Dakota.

WILLIAM GARRISON has left Cananea, to become foreman at the La Dicha smelter, in Durango, Mexico.

HENRY J. GIFFORD has been appointed superintendent of the Champion Reef mine, in Mysore, India.

EMERSON GEE has returned to Los Angeles from mine examinations in the Blue River district of Oregon.

F. W. BOCK has gone from Rochford, South Dakota, to his mines in the Warren Peak region of Wyoming.

J. F. EISMAN of Denver has been inspecting mines in which he is interested at Breckenridge, Colorado.

HORACE G. NICHOLS, manager of El Transito and Porvenir mines, in Nicaragua, is on his way to London.

C. W. WHITLEY, manager of the Garfield smelter, has returned to Salt Lake City from a visit to San Francisco.

C. O'BRIEN has gone to La Cunibre, Sinaloa, Mexico, to take charge of the mill of the Galanista Mining Company.

JESSE A. STEWART has accepted a position as mining engineer with the De Lamar Co., Ltd., at De Lamar, Idaho.

G. C. HEWETT has returned to Colorado Springs from the San Juan region, where he has been examining several mines.

EDWIN W. MILLS has resigned as assistant superintendent of the Oriental Consolidated Mining Co., Chemulpo, to become superintendent of the Chiksan mines, also in Korea.

JOSEPH IRVING has been appointed superintendent of the Continental Smelting & Refining Co., at Ironton, Colorado.

THOMAS MCCORMICK has been appointed superintendent of the Con. Virginia and California mines, at Virginia City, Nevada.

E. C. THURSTON, of the Empire Zinc Co., Canyon City, Colo., has been examining zinc mines on Arrow lakes, British Columbia.

HENRY ARGALL, the oldest son of PHILIP ARGALL, was married on August 3, at Martinez. He is metallurgist at the Selby smelter.

JOHN D. PLATTS is making surveys and plans for the installation of a large hydraulic plant on Myrtle creek, Del Norte Co., California.

J. BOYD AARONS is now manager of the consolidation of the White Feather Reward & White Feather Main Reef mines, Western Australia.

R. H. SUTTON is superintendent of the Copper World mine, for the Cocopah Copper Co., at Ivanpah, in San Bernardino county, California.

CLERMONT LIVINGSTON is general manager of the Tyee Copper Co. and recently received the thanks of the shareholders for his able services.

H. S. KENNEDY has resigned the management of the Lakeview Dredging Co., at Neeley, Idaho, and will leave Butte, Mont., shortly for Johannesburg, South Africa.

G. C. KLUG, who recently resigned as resident manager of the Gt. Boulder Perseverance mine, has become manager of the Phillips River gold and copper mines at Ravensthorpe, also in Western Australia.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, August 15.

Con. Virginia	$0.89	Jumbo	$1.47
Ophir	3.45	Manhattan Con	1.25
Savage	0.90	Mexican	0.74
Tonopah	18.12	Midway	2.30
Belmont	5.37	Mohawk	3.75
Jim Butler	1.45	Red Top	1.60

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 9. £ s. d.	August 16. £ s. d.
Camp Bird	1 4 6	1 5 0
El Oro	1 10 0	1 9 4½
Esperanza	3 1 6	3 5 0
Dolores	2 1 3	2 0 0
Oroville Dredging	0 16 3	0 16 3
Stratton's Independence	0 4 0	0 3 9
Tomboy	1 3 9	1 4 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 9.	Average Prices for Week Ending August 16.
Copper—Lake (cents per lb)	18⅝ @18¾	18⅝ @18¾
" Electrolytic "	18 5/16 @18⅜	18 5/16 @18⅜
" Casting "	18 @18⅛	18 @18⅛
Lead "	5.75	5.75
Spelter "	6.025	6.025
Silver (cents per oz.)	65⅛	66¼

CURB QUOTATIONS—NEW YORK.

	Prices for August 9.	Prices for August 16.
Bingham Central	2¼	2
Boston Copper	25⅞	26⅞
Calumet & Arizona	16½	16½
Cumberland Ely	7⅜	7½
Dolores	9⅜	9½
El Rayo	4⅞	4⅞
Guanajuato Con	5¼	5⅜
Giroux Con	7½	7⅜
Greene Con	25	24⅞
Nevada Con	18¼	18⅛
Nipissing	5⅝	6
Tennessee Copper	46	45⅜
Tonopah Ex	5⅜	5⅜
Tonopah-Belmont	4.90	4.90
Tonopah	18⅜	18¼
United Copper	63	63¼
Utah Copper	27½	27

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

A MODIFICATION of the caving system of mining is being introduced at the Cananea mines.

CHROMITE generally occurs in serpentine. The poorer ore scattered in the serpentine can be concentrated to a high-grade product without trouble. A rude concentration can be made by sluicing.

COVER-GLASSES for microscope slides sometimes appear dingy and it seems impossible to clean them. This may be easily done with a weak solution of sulphuric acid, when water, alcohol, rouge and other things fail to give the desired results.

A TEST of tube-mills for treatment of diamond-bearing rock is being made at the gold mill of the Village Main Reef mine at Johannesburg, Transvaal. The diamondiferous ground came from the Pretoria mines—the test run being 1,000 loads.

A PATENT has recently been issued in the United States for a method of desilverizing lead bullion, the process being in the addition of metallic zinc to the molten bullion, and then adding sal-ammoniac to cause a more complete separation of lead and silver.

THE Seattle, Wash., assay office reports its gold receipts for the first half of 1906 as $20,000,000, of which about $7,000,000 came from the Tanana district, $5,000,000 from Nome district, and the balance from other parts of Alaska, Yukon basin and from the Pacific Northwest.

PASSENGER ELEVATORS in buildings seldom run at a speed exceeding 800 ft. per min., and the greater number run below 500 ft. per min. A mine cage or skip running at this speed is considered slow. Maximum speed in mines ranges from 2,000 to 6,000 ft. per minute.

THE metre is the unit of length of the metric system of weights and measures, and was intended to represent the one ten-millionth of the quadrant of the earth, measured on a meridian from either pole to the equator. The gram is the unit of weight which is the weight of a cubic centimetre of pure water at its greatest density—4.5 deg. C. or 40 deg. F. The latitude is a negligible factor.

YELLOW OCHRE is used in the manufacture of oilcloth and linoleum, and to a small extent in the manufacture of paint. The calcined ochre makes a dark red pigment. Yellow ochre occurs commonly in quartzite, particularly the Cambrian. It is abundant at Cartersville, Ga., and is common in some portions of Colorado and in the Black hills of South Dakota. At Red Cliff, Colo., and in the Bald Mountain district of the Black hills, these ochre deposits carry gold in payable amount.

IN 1880 the annual gold production of the world was about $100,000,000, and that of the United States was about $30,000,000. In 1900 the world's gold production had increased to nearly $300,000,000, and that of the United States to nearly $80,000,000. No one can predict what the future output of gold will be. Important factors in production are the discovery of new gold districts, the development in old districts of new orebodies carrying gold, and more than either of these is the introduction of processes which makes the treatment of low-grade ore and tailing profitable. At present, dredging is also an important and increasing factor.

THERE are now in successful operation in Butte three blast-furnaces each 52 ft. long, and one of them is being enlarged to 89 ft. There seems little doubt that this large furnace will prove as successful as those of only a little over half this length. What the ultimate economic limit in size of a copper blast-furnace will be, it seems impossible to say.

THE Niagara, Lockport & Ontario Power Co. has planned to transmit electric power with aluminum cables from Niagara to Syracuse, N. Y., a distance of 160 miles, and is considering a line to Cleveland, O., a distance of 200 miles. The Niagara and Syracuse line is partially finished. Many miles of aluminum line are in successful use as a carrier of electric current in California.

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Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Zinc-Dust vs. Shaving.

The Editor:

Sir—During the last few years I have had occasion to visit many cyanide plants in different parts of the country, and have noted with great interest the methods employed in different sections. While in the Black Hills a few years ago I observed with great satisfaction the apparent success of zinc-dust precipitation, and noticed with what economy in labor great volumes of solution were handled. The question arises in my mind, Why is zinc-dust precipitation not more universally employed? All cyanide operators are well aware of the great amount of labor necessary to keep zinc-boxes properly dressed and in good working order, to say nothing of the labor involved in the monthly or bi-monthly clean-up. In point of economy in labor, zinc-dust precipitation certainly has the advantage over precipitation on zinc shavings. If it is all that could be desired in other respects, why would it not be economy to design all plants of moderate size with this process?

I think a discussion of the subject by those employing the process, giving figures as to cost of installation and operation, efficiency, etc., would be read with great interest by cyanide operators.

CYANIDE MAN.

Goldfield, Nev., July 28, 1906.

Zinc-dust precipitation in cyanide work possesses distinct advantages over zinc-shaving, and has been employed with marked success at the cyanide plants of the Homestake Company in the Black Hills. This process was evolved there after diligent study, but all the details have never been given to the public, and it is possible that the success of the process at the Lead City plants may depend upon some important trick of manipulation which the management wishes to conceal. Many attempts have been made to use the process at other plants, but without success. It would be difficult to assign the cause for this failure. It may be due to the reluctance of operators to supplant a simple and reliable process for one comparatively complicated and untried; but it would seem to be due in some instances to unfavorable conditions for precipitation, or it may be altogether due to having missed the one feature essential to success, as known only to the Homestake operators. The reason for the continued popularity of zinc-shaving is obvious. The process is simple and appeals to the average intelligence. We join with our correspondent in his wonderment at the slow introduction of zinc-dust, and venture to predict that as soon as the process gets a fair start and the principles of its use are better understood, it will easily supersede the cumbersome method in vogue at the present time. We shall be glad to publish the views of cyaniders on this subject.—EDITOR.

A Mining Method Wanted.

The Editor:

Sir—Since the original article appeared, which resulted in a discussion of the best method of mining a large vein having a low angle of dip, several engineers have contributed from their experience to our common fund of knowledge.

The method proposed by Mr. R. B. Nickerson seems to have answered every requirement in the instance mentioned by him, but I doubt whether he could get equally satisfactory results in the application of this method to a vein as large as that under discussion. His scheme is ingenious, nevertheless, and deserving of a trial. The proposition of cutting the shaft by raising on the foot-wall of the vein from the adit-level, instead of sinking from the surface, is worth consideration, and could be adopted whether the raise be cut in the vein or in the foot-wall country rock beneath it, as described by me. In the latter case, after the raise had reached a point 100 ft. vertically above the adit-level and a stope had been well advanced between the adit-level and the first level above it, the waste broken in the raise above that level (which might be designated as No. 5), could be trammed through a cross-cut to and across the vein on No. 5, and dumped in the stope below for filling. The method of handling cars in this raise, as described by Mr. Nickerson, is admirable and could be economically applied in many cases, not only in flat raises, but in some instances in stopes as well.

The proposition of Mr. R. H. Sutton seems feasible, but I cannot perceive that it has anything to recommend it over the method already suggested. The ore-pockets under the stations, cut as indicated in Mr. Sutton's sketch, are needlessly large, as the ore will not run on the flat slope of 23 deg. which is the inclination of both shaft and vein, consequently there would be only a small amount of ore in the lowest part of each pocket that would run to the skip. In the gangways, chutes from the stopes at intervals of 20 ft. are unnecessarily close, and would consequently involve a small increase in the cost of mining. The proposition to shovel ore from the stopes into mill-holes is little, if any, improvement on my suggestion to shovel directly into cars from the sill-floor, with the possibility of drawing the ore through the chutes without the necessity of shoveling, should the ore break small. In this event cribbed chutes carried up as suggested by Mr. Sutton would be unnecessary. The running of cross-cuts in hanging and foot-wall country to obtain filling would be found expensive. For each section of stope 50 ft. wide, 100 ft. high and extending from wall to wall, there would be required about 30,000 tons of waste rock for filling. The obtaining this filling in cross-cuts at the very low expense of 60c. per ton for breaking, shoveling, tramming and placing in stopes would be $18,000, or about 36c. per ton of ore extracted from the stope, and if this large tonnage of waste were to be handled by wheelbarrow, as suggested by Mr. Sutton, the cost would be increased to $1 or more per ton of ore removed from the stope. Each 50 ft. longitudinal stope would require about 4,000 linear feet of cross-cut 10 by 10 ft. in section, to supply the necessary amount of filling.

Mr. D'Arcy Weatherbe favors the stoping scheme of 'The Prospector,' but believes with Mr. Nickerson that there would be an advantage in raising to the surface instead of sinking, and also favors placing this raise on the foot-wall instead of beneath it. The raise, or shaft as the case may, be, could undoubtedly be cut as well on the foot-wall as beneath it, but this would necessitate the leaving of large wedge-shaped masses of ore on each level which could not be readily removed by the stoping system suggested by me. The latter's scheme does not contemplate stoping barren rock from the foot-wall as Mr. Weatherbe appears to think, though the sketch might lead to such conclusion. The intention was to cut into the foot-wall at the ore-pockets only, merely to facilitate working, and was a part of the economy of the system. The small amount of ore remaining under the sill-floor of each stope, on the hanging-wall side, could be readily mined and sent down into the next adjoining stope, as it is all within easy reach of the timbering on the line dividing stope and pillar. The entire amount to be thus handled would not exceed 1,000 tons to each 100 feet of longitudinal stope, whereas, by Mr. Weatherbe's

scheme, this wedge would contain about 5,000 tons of ore in each 100 ft. longitudinally of the vein, the additional cost of handling which by any method would go a long way toward offsetting the difference in cost of placing the raise, or shaft, under the vein in the foot-wall.

The reason for hoisting through the shaft was to facilitate reaching a mill already on the property, which fact should have been stated in the original proposition. My plan for obtaining filling contemplated only the cutting of a single shaft or raise, connecting with the open-cut on the surface, and the distribution of the rock to the stopes by a series of mill-holes, sunk from the drifts, run over each line of stopes. Obtaining and placing filling by this method should not exceed 20c. per ton of ore extracted, if the ore-shoot proved to be 300 ft. or more in length. The scheme suggested by Mr. Weatherbe, that the stopes be mined without timber, or filling, until a cave threatened, makes no provision for subsequently safely obtaining the ore remaining in the block at the time of the cave. Of course a pillar-and-stall method might be adopted throughout, but the value of ore necessarily left standing in the mine would probably amount to more than the cost of getting all of the ore by a somewhat more expensive, though safe, method. It seems unnecessary to state exactly the value of the ore, the object being to get a mining method not necessarily dangerous and which permits the removal of the maximum amount of ore at the least expense. There is no reason why a more expensive system of mining should be adopted on a rich orebody than would be applied to the extraction of ore that is low grade. THE PROSPECTOR.

August 3, 1906.

THE surveyors-general are appointed by the President for the respective surveying districts. They have the appointment of deputy mineral surveyors at their discretion, although their action in suspending or revoking appointments of deputies is subject to review by the general land office before final action is taken. They are not permitted to make surveys in a district for which they hold no commission, and they are not permitted to act in the double capacity of surveyors and attorneys for mineral applicants at the same time. They are *not* prohibited from making mineral entries in their own name in the district for which they are appointed, but in that event they cannot act in any other capacity than that of claimant; that is, they cannot survey their own claims, nor any claim in which they have an interest, for patent. In consideration of the foregoing, the Nevada deputy mineral surveyor was within his legal rights when he relocated an abandoned claim, and the lessee had no rights in the premises further than was conveyed by the terms of the lease. As to his dismissal as deputy surveyor, it would probably be difficult to secure a review now and to be reinstated in office. It would probably be more profitable to oust the jumper by legal process, as he has no color of title if the case has been properly stated.

A SERIOUS DETRIMENT to the making of a road in Alaska is the thawing of the ground beneath the moss. It has been the universal experience that wherever the moss is cut into, thawing immediately commences, and the trail which was passable becomes a filthy, slimy mass of mud, roots and broken stones—a difficult route for men on foot, a slow and tiresome road for loaded animals, and an impassable obstacle to any sort of vehicle. In regions farther south, under temperate conditions, trails frequently are developed into fair wagon roads by much usage. Such developments can never take place in any part of the Northwest.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Prescott, Ariz., marked Thum Butte, is Hornblende-andesite.

Rock samples marked B. M. Co. are determined as follows: No. 1, 2 and 3, Andesite; No. 4, Hornblende-schist.

The rock from Tehachapi, Cal., marked F. A. F., is Quartz, in which is embedded the common brown variety of Garnet.

The samples from Ingot, Cal., marked C., are: No. 1, Garnet (brown) and Halloysite (yellow); No. 2, silicious iron ore and a little Malachite (copper carbonate), and Chrysocholla (copper silicate).

The rocks from Tombstone, Ariz., marked A. G., are much decomposed. The smaller, darker piece, is much altered Granite, or Diorite, infiltrated with calcium carbonate. The larger piece is a mass of rock fragments of many kinds, partly water worn and cemented by carbonate of lime.

The rocks from Edgewood, Siskiyou county, Cal., marked J. D. E., are: No. 1, Epidote; No. 2, Aplite; No. 3, principally Magnetite, with a film of Malachite (green copper carbonate); No. 4, Barytocalcite; No. 5, Hornblende, with disseminated magnetite grains; No. 6, Chromite; No. 7, Chromite, somewhat decomposed; No. 8, Talc-schist; No. 9, Cinnamon stone (garnet).

The rocks from Cœur d'Alene, are: No. 1, slightly schistose greenstone, probably originally Diorite. One piece exhibits slickensides, due to pressure and movement within the rock mass. It is partly altered to talc-schist; No. 2, a very silicious Aplite, discolored by iron and manganese oxides; there is also a development of scales of black and white mica of secondary origin; No. 3, the grayish-white honey-combed piece is also Aplite, less silicious, and at one time evidently contained pyrite which has been oxidized, leaving the numerous cube-like holes, some of which contain iron oxide.

INVESTIGATIONS IN EGYPT made by the Government in 1904 and 1905 in the desert between the Nile and the Red sea, starting in near the town of Edfou, are encouraging to both old mines and new. At the northernmost point of the mineral fields is the concession of a Cairo syndicate, which is prospecting in the northern half of the Sinai peninsula. The discovery of copper is reported. Another syndicate, while prospecting for coal and other minerals to the south of latitude 28 deg., and to the north of the Egyptian Mines Exploration Co., has found extensive ancient workings in the neighborhood of Jebel Zeit, about 12 miles from the Red sea. This is the most northern point at which ancient gold mines have, as yet, been discovered. The concession of the Northwestern Exploration Co. lies on the west side of the river. At the Um-Rus Gold Mining Co.'s mine, in the southeast corner of the concession, a large plant has been erected. The main shaft is down 550 ft. The present output varies between $6,000 and $8000 per month. To the south, E. W. Streeter has a concession to work the emerald mines and also a prospecting license for other minerals. Ancient workings of gold, lead, copper, iron, emeralds and sulphur are known to exist there. Practically all the mines are within 30 miles of the Red sea.

Copper at Butte, Montana.---II.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR H. HALLORAN.

The Butte mines may be most logically listed and described by means of the holding companies. The Amalgamated Copper Co. holds the controlling interest in many of the big producers. F. Augustus Heinze formerly operated several adjoining mines, through the Montana Ore Purchasing Co. and the United Copper Co. The history of the bitter feud between the two controlling interests at Butte is famous. In February of this year Heinze's interests were bought by persons friendly to the Amalgamated Company, and a new company was formed, known as the Butte Coalition. This is merely a holding concern, as the mines are to be worked by the Red Metal Mining Co. A. C. Carson is manager of this, as well as of the North Butte Mining Co. W. A. Clark operates through the Original Mining & Smelting Co. Other organizations will be described in the order of their incorporation.



Lowering Timbers in a Stope.
By Courtesy of the U. S. Geological Survey.

The subsidiary companies of the Amalgamated yield 10,000 tons of ore daily; they include the Anaconda Copper Mining Co., the Boston & Montana Consolidated Copper & Silver Mining Co., Butte & Boston Consolidated Mining Co., Washoe Copper Co., Parrot Silver & Copper Co., and the Trenton Mining & Smelting Co. The North Butte Mining Co. is closely allied to these, as is indicated by its list of shareholders, and as was shown in the courtesies extended during the temporary inability to hoist ore.

The Anaconda Copper Mining Co. is operating the Anaconda, Never Sweat, St. Lawrence, Gallatin, J. I. C., High Ore, Mountain Consolidated, Diamond and Bell mines. The Belmont shaft is used to work a portion of the Anaconda ground. This company, of which John D. Ryan is general manager and John Gillie general superintendent, employs over 3,000 men. The Anaconda and



St. Lawrence Mine.



West Central Portion of Butte.

11. West Stewart. 10. Mountain Consolidated. 9. Corra.



Moonlight Mine.

Never Sweat shafts are 2,450 ft. deep, the St. Lawrence 2,200 ft., the High Ore, Diamond and Mountain Consolidated each 2,200 ft. and the Bell 1,600 ft. The High Ore is being continued to the 2,400-ft. level. Each shaft has three compartments, the High Ore shaft being the best equipped; through it all the water from the Anaconda, Washoe and Parrot properties is being pumped. This is done in three stages from the 2,200-ft. level to the 1,600, then to the 900, and finally to the outlet on the 350-ft. level. Each pumping unit comprises three Dickson pumps, with a combined capacity of 1,500 gal. per minute.

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During the year ending June 1, 1906, the Boston & Montana Co. extracted 1,209,805 tons of ore, averaging $12.82 per ton in copper, gold and silver. The cost of mining was $3.46, of transportation for 172 miles to the smelter $0.93, and of reduction $2.45 per ton. The Anaconda Co. extracted $1,521,310 tons, yielding $10.92 per ton, and costing, for mining $3.63, transportation 27 miles $15, and reduction $2.27 per ton.

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The Steam-Shovel at Bingham.

Written for the MINING AND SCIENTIFIC PRESS
By LOUIS S. CATES.

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It was not until February, 1905, barely seventeen months ago, that development work was started in the northeast portion of the property, which covers 75 acres of the copper-bearing porphyry. During that time an aggregate length of four miles of prospecting tunnels has been done for a distance of about one mile on the strike of the porphyry. The results of this work have been so encouraging that preparations are being made for mining a large tonnage to supply the mammoth mills now in course of erection in the valley.



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The porphyry is covered with a capping of surface loam and oxidized ore for a thickness varying from 15 to 70 ft., and the first task is to remove this waste preparatory to getting at the ore.

We had to devise an economical method for breaking the ore; air-drills were not deemed suitable; the machines would be too large and they would be unable to go down the 60 to 70 ft. necessary in some parts of the property. Furthermore, the porphyry is full of small cleavage cracks which would easily cave holes the size an air-drill would put down. The question resolved itself into finding a machine which could be put to work as near as possible to the point of power generation, thereby diminishing the various mechanical losses, and one which would drive a hole sufficiently large at the bottom to hold the charges of black powder. The Keystone well-drill, size No. 3, proved the ideal machine, This drill is self-contained, having its boiler and engine mounted on wheels; it is self-propelling and uses a 5⅝-in. bit, capable of sinking from 60 to 70 ft. of holes 5½ to 6 in. diam. per 12-hr. shift.

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The porphyry breaks small and makes excellent material for shoveling. The shovel handles 400 cars or 2,500 tons per 10-hr. shift. As for costs, they are not obtainable yet, for operations were only begun on June 23; but judging from this short period, the costs should be below 12c. per ton. By September 1 this equipment is to be trebled, so that it will consist of three steam-shovels, 14 engines and 175 dump-cars.

THE geologist, miner and prospector naturally expect to find in Wyoming, situated as it is between Montana and Colorado, rich mining districts, but up to the present extensive or remunerative gold and silver deposits have not been found. In 1868, in the Wind River mountains, gold placers and veins were found and these were worked for several years, producing in the aggregate $500,000. The principal camps were at Independence, Miners' Delight, South Pass City and Atlantic City. Within the past year or two there has been a revival of mining activity in these old districts. In eastern Wyoming some gold—placers and quartz—and some tin ore has been found in the Black Hills, and also gold and copper near Warren's Peak in the Bear Lodge range, northwest of the Black Hills. At Grand Encampment, in Carbon county, and at Rawhide Buttes, in Laramie county, are copper deposits. Judging from the float, copper ore and copper-stained quartz scattered over the Wyoming plains, near the Laramie range, there is copper in these mountains as well. The most promising portion of the State for the prospector is the northwestern part in the Shoshone, Teton and northern Wind River ranges, where old crystalline schist—Archæan or Algonkian—are flanked by up-lifted sedimentary rocks of Paleozoic time. If a region of intrusive dikes, or laccolites, can be discovered in any of these mountains, the prospector's chance is good for finding new and profitable mining districts. That region is extremely rugged, several hundred miles from the nearest railroad, and of it comparatively little is known. The region described is probably the largest area in the western United States where there is a reasonable chance of finding good mines, that has not already been run over by that advance agent of civilization — the prospector.

THE CHINESE make iron direct from ore, in China, by mixing four parts of ore, one part of small coal, and one part of decomposed coal dust, this mixture being placed in a crucible about 18 in. deep and 6.5 in. diam. The soft, decomposed coal is obtained from the upper portion of veins along the outcrop. The crucibles are heated in a small furnace, having walls about three feet high, the rear wall being that of a small hut which shelters the men who work the bellows supplying the blast. The floor of this furnace is about 4 by 6.5 ft. and is covered with clay, on which is spread seven to eight inches of coarse coal. On this 60 or more pots are placed, the space between them being filled with small coal, and the pots are covered with a layer of small coal a few inches thick; over all is placed a layer of cinders and ashes to the depth of several inches, the front space being filled up with old crucibles. After 16 hours of strong heat the fire is allowed to burn down and the crucibles are removed and broken, each containing a small mass of carbon iron, which is made into wrought iron by re-heating over a wood fire and hammering while still red hot.

ABOUT 400 ft. per min. is a fair rate of hoisting in a shaft with ordinary winding machines, such as are usually installed at shafts 500 to 1,000 ft. deep, and where the amount hoisted daily does not exceed 400 to 500 tons. Large hoisting engines designed for much greater capacity, and greater depth, wind at the rate of 1,000 to 6,000 ft. per minute.

On the Cumbre de San Manuel Trail.

Written for the MINING AND SCIENTIFIC PRESS
By COURTENAY DE KALB.

At the present moment the extreme southwestern portion of Chihuahua is the most inaccessible and unsubdued part of the Mexican Republic. Though there are many districts surpassing it in the picturesque, none approaches it in the rugged grandeur of its mountains and in the solemn impressiveness of its mighty canyons. Nowhere else in North America exists so wild a labyrinth of deep-cut gorges, and nowhere will the traveler journey so far and make so little effective progress as in the upper water-shed of the Sinaloa and its splendid tributary, the Bazonopa. During a five days' journey the snow-clad peak of Muinora was the one prominent landmark, reappearing from every eminence reached on the trail, its distance seemingly undiminished, a sublime spectacle, like a worn sphinx in shape, set upon a massive rectangular pedestal at the end of the longest and highest ridge of the central Sierra Madre. It may convey a stronger impression of the mighty effects of stream-erosion which have been produced in this portion of the great range of western Mexico, to be told that in the midst of these pine-clad summits, where the snow lingers late into summer, a half-hour's ride will lead one down to pretty *vegas* nestling under the canyon walls where a semi-tropical climate favors the culture of bananas, papayas, and sugar-cane.

Unlike the great canyons of Colorado and Arizona, which have for the most part been carved out of feebly resisting sandstones and shales, the gorges of the Sinaloa and Bazonopa have been cut through rhyolites and andesites, the latter forming an ancient floor upon which the rhyolites have been poured in successive layers. As denudation has revealed the geological structure of the region, these layers stand forth in strong relief on the canyon walls, simulating stratified rocks, and often producing a series of terraces, while the jointure adds a columnar effect which gives to some of these occurrences a striking resemblance to gigantic cathedral organs.

The original pathfinder through this bewildering maze of mountains was, of course, the Indian, but the Spaniard was equally intrepid as a blazer of trails, with the added difficulty of having to pick a way for his horses and mules. Nothing could daunt him in his search for gold, and apparently no wilderness could long preserve its treasures hidden from his sight. A short distance east of the Bazonopa river, only 26 miles as the crow flies, but fully 65 miles by the tortuous trail, are the famous mines of Guadalupe y Calvo, which were discovered in 1838. The output of precious metals from these bonanzas was so great, in the first seven years amounting to 162,562 oz. gold and 5,869,267 oz. silver, that the Mexican Government established a mint in this remote section of the mountains in 1844, and a large commerce flowed over trails leading eastward to the central plateau, and westward to the fertile lowlands of Sinaloa and the ports on the Gulf of California. Twenty years later another excitement was produced by the discovery of a new bonanza at the Cumbre de San Manuel, three miles from the Bazonopa river, followed by the exploration of many other veins in the same district. The most interesting of these was the Guadalupe, which was the scene of active and profitable mining for a decade. The ore was difficult to treat, but the native metallurgists secured a fairly good extraction by roasting in *adobe* reverberatory furnaces, and subsequently grinding and amalgamating in *tahonas*. Report credits these ores with having averaged an ounce in gold to the ton, which was probably true for the richest shoots, and the vein was esteemed so rich that the local regulations allowed to each

miner a claim only 35 ft. in length on the outcrop. As a result of this restriction mining was conducted by a series of open stalls, from which in a few cases shafts were sunk from 60 to 125 ft. deep. The greatest depth of vein worked was only 185 ft., the value decreasing below the limit of profit under the conditions then existing. It was not recognized that the bonanza deposits at the surface occurred where divisions in the vein, caused by immense 'horses' of included country rock, had re-united, and such junctions taking place in both horizontal and vertical planes had favored the concentration of ore.

The outcrop of the Guadalupe vein is remarkable for its prominence and its persistence. The hard quartz stands out like a masonry wall above the confining andesite, and can be followed from the town of La Cumbre de San Manuel, where it disappears under a capping of rhyolite, down the great ridge, or *cordon*, to the Bazonopa river, a distance of three and a half miles, the difference in elevation between these two points being 3,500 ft. It shows forth conspicuously on the canyon walls on both sides of the river in great wax-yellow zones, and disappears again toward the east under another capping of rhyolite. At short intervals there appear four other parallel veins of similar character in the canyon of the Bazonopa, measuring from 10 to 60 ft. in width. Off-shoots from this system of parallel veins traverse the country in all directions, many of these spur-veins having been worked by the Mexicans in a desultory fashion. One American company is today operating a small mine, known as El Pochi, three miles from La Cumbre, and the Premier Development Corporation of Mexico, Ltd., is making elaborate preparations for opening up the San Juan Nepomuceno mines a few miles to the northward. On the east side of the Bazonopa river, closely connected geologically with the Guadalupe vein, is a large low-grade copper property, with a heavy gossan, which has been much heralded as a promising mine and southwest of the Guadalupe mine is a strong vein carrying large quantities of zinc-blende, associated with galena and chalcopyrite.

It is noticeable that the off-shoots from the great Guadalupe vein carry large quantities of copper and zinc, and also that, relatively to the other metalliferous minerals, zinc-blende abounds toward the westward, and chalcopyrite toward the eastward, throughout the entire system of veins. The veins are all distinctly of the replacement type, occurring entirely in the older andesite and granite, in close association with later dikes of dark aphanitic andesite, and the deep erosion prior to the final outflows of rhyolite reveals these veins unaltered in width and mineralogical character to a depth of 3,500 ft. It is interesting to observe that the ancient topography, resulting from the erosion of the older andesite, diorite and granite of the region, has been practically restored on the same lines by erosion subsequent to the enormous outpouring of rhyolite which filled all the old valleys, and capped the whole with great lava steppes. It is evident that the shrinkage of the lava-fills in the ancient valleys must have opened lines of weakness through the overlying horizontal capping, which the drainage rapidly widened and deepened, until the canyons and *arroyos* were restored, only deeper and with more precipitous sides. In a few cases minor veins have been formed in the overlying rhyolite and rhyolite tuff, but all the known veins of importance occur in the ancient andesite, or associated with andesite dikes through granite, which latter first appears near the summit of the great ridge at La Cumbre de San Manuel, and becomes increasingly common from that point westward toward Bacubirito. A conspicuous feature of the veins in the granitic areas is an increase in the silver content of the ores.

Following the old trail westward, a remarkable occurrence of limestones and shales is first encountered near Valgame Dios, extending for many miles, faulted, distorted, and intruded by the granite and andesite, and overlaid by horizontal flows of rhyolite. These later eruptives form one extensive *mesa* at San Vicente on the east bank of the Sinaloa river, where the superincumbent lava-flows are 1,100 ft. deep, resting upon an exposed thickness of 400 ft. of confusedly distorted limestone and indurated shale. Numerous copper deposits, mostly in contact with limestone, have been discovered in this district, notably at Valgame Dios and Platano. Some of these deposits have great promise, and are well worthy of careful investigation. The ores are more basic than those in the Bazonopa valley, but contain smaller quantities of the precious metals.

The climate of this district is semi-tropical, and yet so tempered by the surrounding mountains that wheat and sugar cane, oranges, bananas, and apples, meet in the same fields and gardens. Platano is an especially fertile and delightful spot, with scenery of almost matchless beauty. The great peaks and ridges rising above it are well covered with oaks, *tepehuaje*, and other hard woods, while the Platano and Naranjo *arroyos* strike back within a few miles to the pine-clad slopes of the great Sierra. The *arroyos* yield abundant water, and only a few miles below is the Sinaloa river, in which a large permanent supply of water is available at all seasons. The region is ideal for mining, and the well-known existence of so many promising veins of copper and other metals gives occasion for surprise that American prospectors have paid so little attention to this field.

The prominent ridge of Ocorahui, rising to altitudes of from 3,500 to 7,000 ft., lies west of the Sinaloa river, causing it to make a long detour toward the north before it finds an outlet to the coastal plain. This magnificent range, possessing some local celebrity from the copper-gold mine of La Joya, is composed of a granitic core, with great intrusions of andesite on both the east and west flanks. On the western slope, in the Zapote *arroyo*, are seen multitudes of trap dikes, and where these have intruded through the granite they are usually accompanied by strong veins of black quartz, both in color and texture simulating the appearance of anthracite. A few grab samples from these veins casually gathered *en route*, revealed in all cases small amounts of gold, the highest assay being $3.50 per ton.

There are persistent rumors of the occurrence of coal in the drainage basin of the Zapote *arroyo*, for which these black quartz veins may be responsible. On the other hand, however, there are large areas of stratified rocks in the valley, containing some shales which are distinctly bituminous. Near the Rancho del Padre, within a distance of three-fourths of a mile, a total vertical thickness of 310 ft. of these tilted sedimentaries was measured. Limestones are also abundant in the same basin, one series of strata yielding a fine-grained argillaceous limestone which would make a fair grade of natural cement. Very pure limestone and good clays, suitable for the manufacture of portland cement, are abundant in the vicinity of Rancho del Padre and Temuchino.

The thickness of the sedimentary rocks in this basin cannot readily be determined. They apparently represent the remnants of a great syncline, the major portions of which have been denuded. They are surrounded on all sides by andesite and granite and have been excessively faulted and crumpled, and in places shot through by dikes of dark basic eruptives. Between Temuchino and Bacubirito the sedimentaries have been largely covered by andesitic breccia and tuff, which also fill the broad basin of Bacubirito. At the latter city, which is certainly the most picturesque mountain town in the State of Sinaloa, a strong tributary, known as the Descubridora,

joins the Sinaloa. This stream is notable for its placers, from which a large output of gold has been derived in times past; the native washings still yield a considerable amount, conspicuous for very showy nuggets.

LOW, in 'Technical Methods of Ore Analysis,' gives the following scheme for testing tungsten ores: "Treat 0.5 gram of the finely powdered ore in a small platinum dish with equal parts of strong hydrochloric and hydrofluoric acid. Digest on a water-bath until solution is complete, adding more of each acid from time to time if necessary. It may require from one to several hours to effect complete decomposition of the ore. Usually a perfect solution may be obtained. Finally evaporate to about 15 c.c. with an excess of hydrochloric acid. A yellow precipitate of H_2WO_4 may separate during the final evaporation, owing to the expulsion of the hydrofluoric acid that holds it in solution. This will do no harm provided it can all be removed from the dish. Transfer the solution and any precipitate to a six-ounce flask, add 20 c.c. of strong hydrochloric acid and 8 c.c. of strong nitric acid. Boil down to about 10 c.c. This will expel any remaining hydrofluoric acid and precipitate the tungsten as tungsten acid—H_2WO_4. Dilute with 50 c.c. of hot water and allow to simmer at a gentle heat for about half an hour, or until the tungstic acid has settled clear. Filter, wash well with hot water slightly acidulated with hydrochloric acid, and then dissolve the tungstic acid on the filter by pouring warm dilute ammonia over it using as little as possible and washing the filter with the same solution. Receive the solution in a weighed platinum dish. Evaporate the solution on a water-bath to dryness and then ignite the residue at red heat, cool and weigh as WO_3. The cold residue should be bright canary color. Multiply the weight of the WO_3 by 0.793 to obtain the weight of tungsten, from which the percentage in the ore may be calculated."

AT the recent session of the International Miner's Congress in Europe the report of the credential committee was to the effect that there are 708,200 miners in Great Britian, of whom 480,000 were organized, and had elected 14 members of the House of Commons. In France there are about 200,000 miners, and 150,000 are organized; they had two members in the French Parliament. In Belgium there are 135,000 miners, 65,000 of whom are organized, and they had two members in the Belgian Parliament. In Germany there are 600,000 miners, of whom 112,000 belong to the German Miners' Federation and 70,000 belong to the German Christian Miners' Federation. Austria has 135,000 miners, of whom 40,000 were organized in unions. The United States has 550,000 miners, 365,000 of whom belong to unions. It was therefore claimed that out of something like two and one-fourth million miners 1,282,000 were organized in trade unions, and had sent 116 delegates to the Congress.

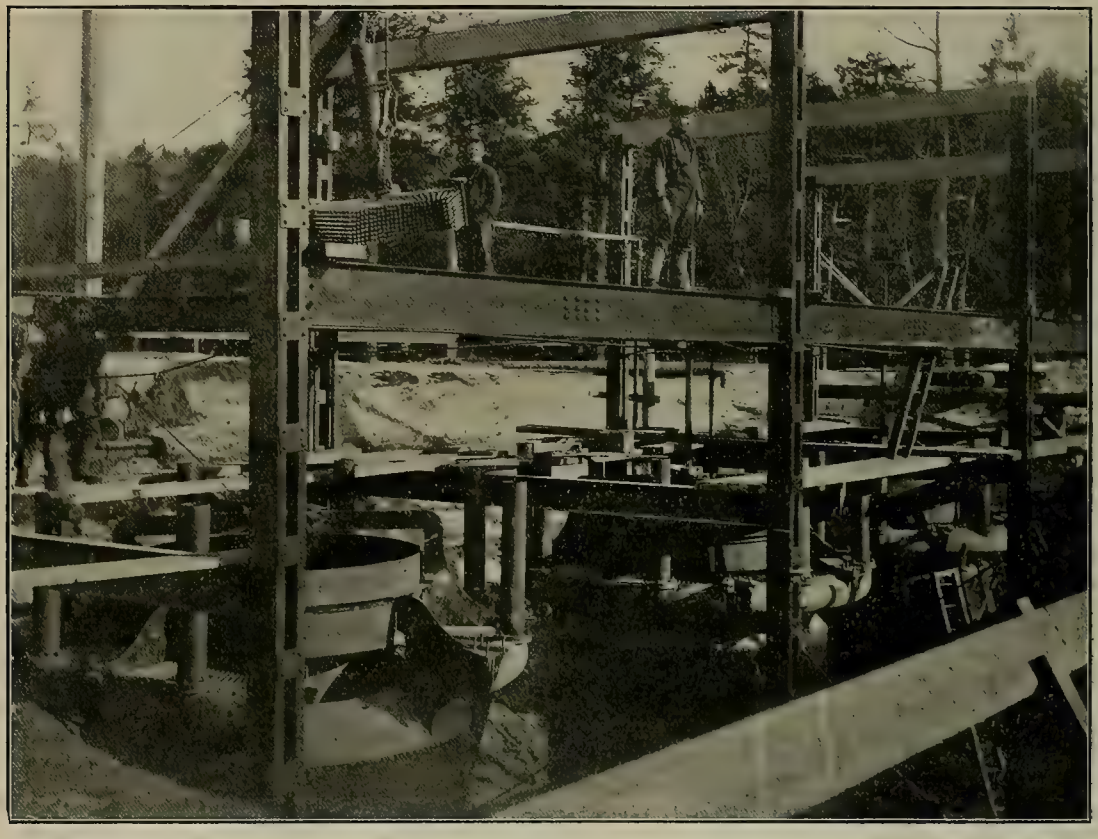


Fig. 1. Steel Structure in fore-bay supporting the three compressor-heads over each shaft. On the head-piece to the left a space is open wherein the pipe-head containing the small air-inlet tubes hanging on the derrick, just above, is to be placed.

ANY rock or ore which gives a decided reaction for tellurium should be assayed for gold and silver. Tellurium, however, is not always accompanied by gold. It forms combinations with other minerals, such as nickel, lead and mercury. Where any traces of gold and silver are found associated with tellurium, it would be well to seek in the vein for a richer pay-shoot. The geological conditions stated by the Sandy, Nevada, correspondent would usually be considered favorable to the occurrence of orebodies. The occurrence of numerous quartz crystals in the vein has no particular significance, unless it indicates the pockety nature of the vein, which it certainly does in some districts.

Hydraulic Air-Compression at the Victoria Mine.

Written for the MINING AND SCIENTIFIC PRESS
By C. H. TAYLOR.

In response to a request from the editor of this journal I take pleasure in presenting an account of the hydraulic air-compressor I have just completed for the Victoria Copper Mining Co., near Rockland, Michigan, and a copy of the report on the efficiency test made by Professors Sperr and Hood of the Michigan College of Mines.

The capacity of the compressor in free air is 36,000 cu. ft. per min., compressing it to a pressure of 117 lb. per sq. in., or over 5,000 h.p. The water supplying this compressor is taken from the Ontonagon river. A concrete dam 500 ft. long and 18 ft. high crosses the river at a point 4,000 ft. up-stream from the compressor, and a canal having a cross-sectional area of 350 sq. ft. leads from the dam to the forebay of the compressor, giving a working head of 71 feet.

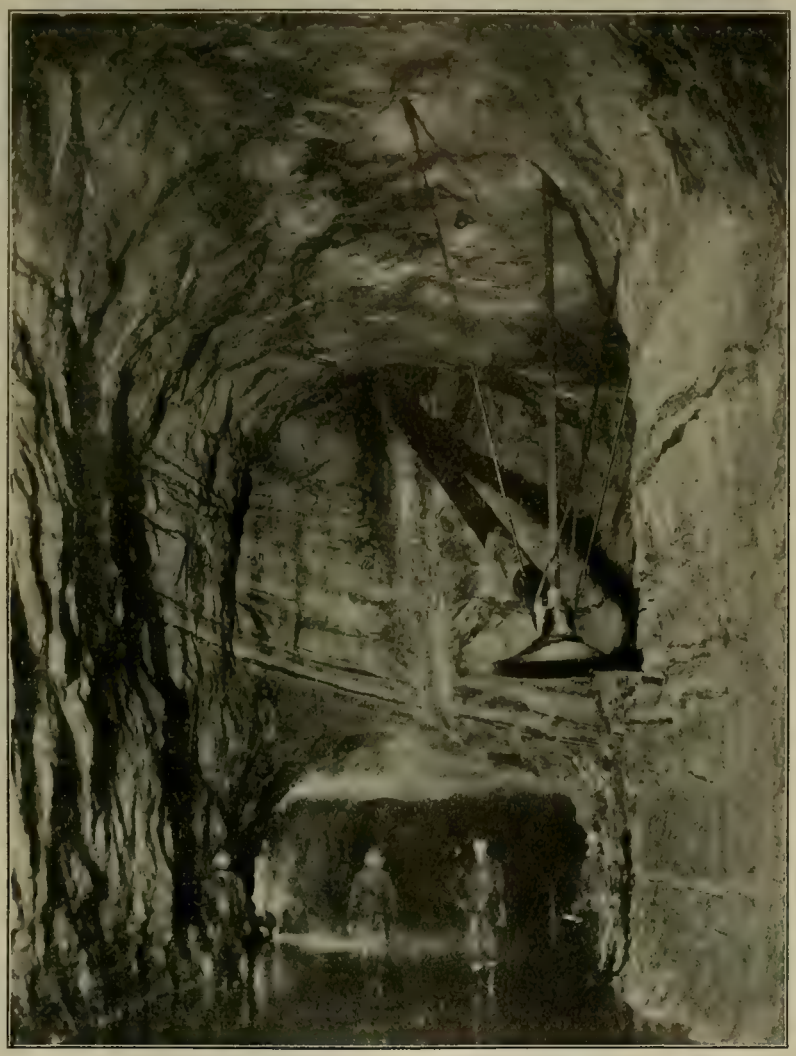


Fig. 2. Flash-light view showing outlet end of air-separating chambers. In the upper corner the end of the 24-in. air-main is shown with a strainer at its end; leading down with a saucer piece on its end is the 12-in. blow-off pipe. The low tunnel at the bottom is the water escape which connects with a tail-race shaft.

The compressor has three intake shafts which are sunk to a depth of 330 ft., connecting them with the air-chamber or separating-tunnel. These shafts are sunk in sandstone and concreted their entire length, leaving a smooth interior of 5 ft. diam. At their lower end, a tapering pipe is cemented in, its lower end having a diameter of 7 ft. 4 in., while the upper end is of the same size as the shaft. These pipes extend downward into the tunnel 16 ft. and up into the concrete 14 ft. The flash-light view (Fig. 5) illustrates this construction.

The tunnel or separating chamber is 57 ft. wide and 22 ft. high where the intake shafts enter, and it tapers to 18 ft. wide and 25 ft. high at a distance of 50 ft.; from this point it continues at the same height for 281 ft. further, when it drops vertically to 10 ft. high and connects with the discharge-shaft, which has a cross-sectional area of 288 sq. ft. A sectional view of the compressor and excavation is shown in Fig. 4.

Fig. 2 is a flash-light photograph of the discharge end of the tunnel, showing the 24-in. air-main with a protecting strainer where it emerges into the air-chamber in the upper corner. The pipe reaching downward is the escape or blow-off, which prevents the water being pressed below the saucer-shaped foot-piece; the air escapes through this pipe as soon as the saucer end is uncovered, filling and sealing it up again as soon as the water covers it. Fig. 1 is the steel structure over the intake shaft, supporting the head-pieces. Fig. 3 gives a fair idea of the cold produced by the expanding air as it comes from the stamp-engine You will notice the exhaust pipe is all covered with ice which has accumulated on the outside from the moisture condensing and freezing to it during warm weather. The temperature of the exhaust is from 40 to 50 degrees below zero.

The principle of the compressor is simple: The water is drawn in between two conical castings, having an adjustable space or opening; between these two castings are placed 1,800 three-eighth in. standard pipes, the arrangement of which is shown in Fig. 1. The partial vacuum caused by the descent of the water draws the air through the small pipes which take air through the 7-in. vertical pipes in the headers, whose upper ends open to the atmosphere.

With the proper setting of the head, the air produces a vibrating sound resembling the running of a pair of iron gears at high speed. This vibration is caused by the bubbles of air separating from the ends of the small tubes; these bubbles are disseminated through the whole column of descending water and forced down to the end of the compressor-shaft, striking the conical spreaders shown in Fig. 5, which scatters the water into the

separating chamber. On its course to the discharge shaft, it rises to the surface of the water, accumulating there, and displacing the water until it is forced down to the saucer-shaped end of the blow-off pipe, when the air escapes, preventing the water from being forced down any further. If the air is drawn through the 24-in. air-main to the full capacity of the compressor, the blow-off becomes inactive. The separated water passes on through the lower tunnel (shown in Fig. 5) and up the incline shaft to the tail-race. The pressure of the air is equal to the vertical height of the water in the discharge shaft only. The natural water-head controls the volume of air to the extent of the volume of water available together with the dimensions of the compressor. A compressor of this kind can be constructed to give any pressure and any horsepower, depending upon the natural head and the quantity of water.

The object of sinking three separate compressor-shafts in this particular case is due to the fact that during some years the dry spell lasts so long that the water available from the river decreases in volume so that there would be only sufficient to supply one head and run it efficiently. Each head will work at a high efficiency varying from 1,000 to 1,750 h.p. There would be a marked drop in the efficiency if the water should drop below developing 1,000 h.p. With the three shafts, a high efficiency can be obtained all the time.

The head-piece is constructed so that it can be raised or lowered either by hand or by admitting air under the inverted tank surrounding it, its connection with the shaft being a telescope-pipe. It is also arranged to work automatically, if desired, during a scarcity of water. This is accomplished by a small blow-off pipe, shown in Fig. 1, which runs up the centre shaft and is concreted in its side. The foot of this blow-off is set at an elevation of 13 in. above the main blow-off and is controlled by a valve at the surface. As soon as the air accumulates in the chamber and forces the water down below its lower end, it escapes up this pipe (when the valve at surface is left open), displacing the water in the inverted tank around the head-piece and raising it above the water-level; the water then remains there as long as it continues to blow. Referring to Fig. 3, a valve will be seen on the side of the tank; this valve is left slightly open, so as to allow the air to escape, causing the head to settle down as soon as the small blow-off ceases to supply the necessary air to overcome the air escaping through this valve.

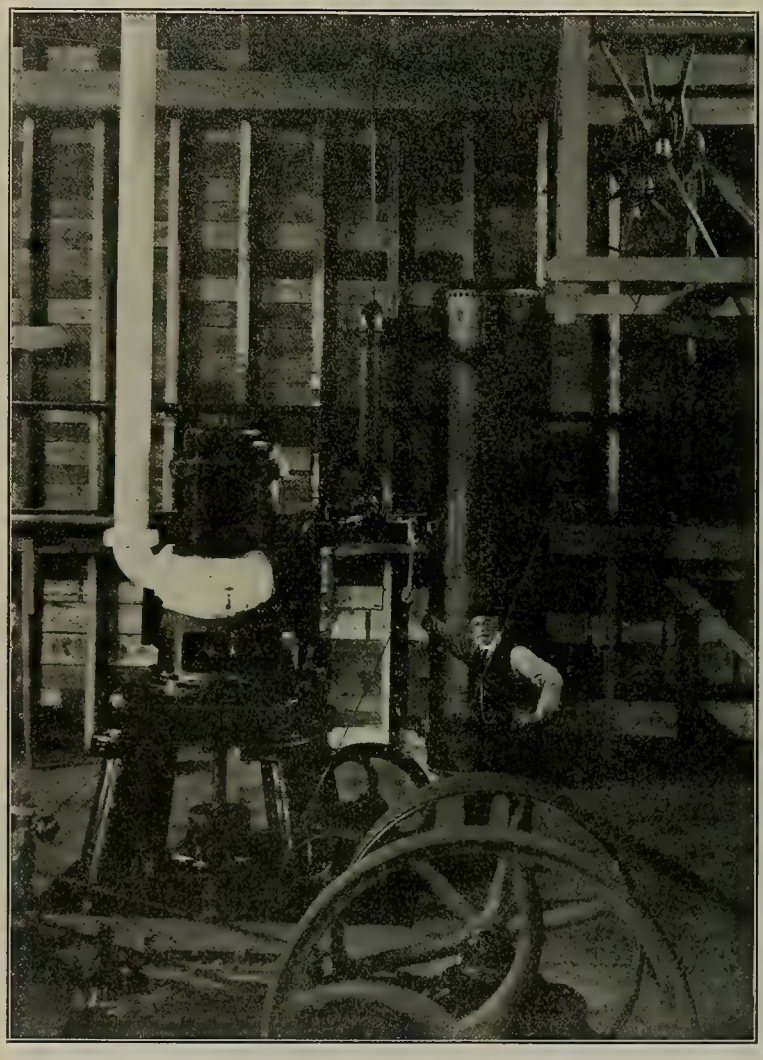


Fig. 3. Three-ton stamp direct-driven by piston-cylinder 18 by 26 in., making 100 blows per min. The outside of the exhaust is covered with ice caused by the condensation of moisture from the surrounding atmosphere. This stamp is driven by air from the hydraulic air-compressor.

With the present development of the mine one of the three heads supplies a third more air than is required. The machinery now in operation and driven by the air thus compressed includes:

One Webster, Camp & Lane direct-connected Corliss hoisting engine, two cylinders 20 by 48 in., having a hoisting speed of 1,500 ft. per min. from a depth of 3,000 ft. with a load of six tons.

One rock-house engine, cylinder 14 by 12 in. running 125 r.p.m. and driving two large crushers.

One machine-shop engine of 14 horsepower.

One small engine in blacksmith shop, 8 horsepower.

One drill sharpening machine, one air-hammer and three forge-fires.

Seven 150 and 200-gal. pumps, raising water out of the mine, which is 2,200 ft. deep.

Ten No. 3 Rand drills.

One 13 by 24-in. double-cylinder winding engine hauling cars to and from the mill, a distance of 4,000 ft., with a capacity of 400 to 500 tons per day.

One Ball stamp-head, cylinder 18 by 26 in., capacity from 350 to 500 tons. This head works with a wide open throttle and strikes 100 blows per minute.

One 10 by 12-in. mill-engine running 190 r.p.m. and driving 56 large jigs, 6 Card concentrating tables and the valve-gear of the stamp-cylinder.

One 12 by 16 in. sawmill-engine.

In addition there are several air-lifts and other sundry applications. This plant was started on March 9 and has continued in operation constantly; from all appearances it can continue to do so for the next fifty years.

The advantages of this compressor are:

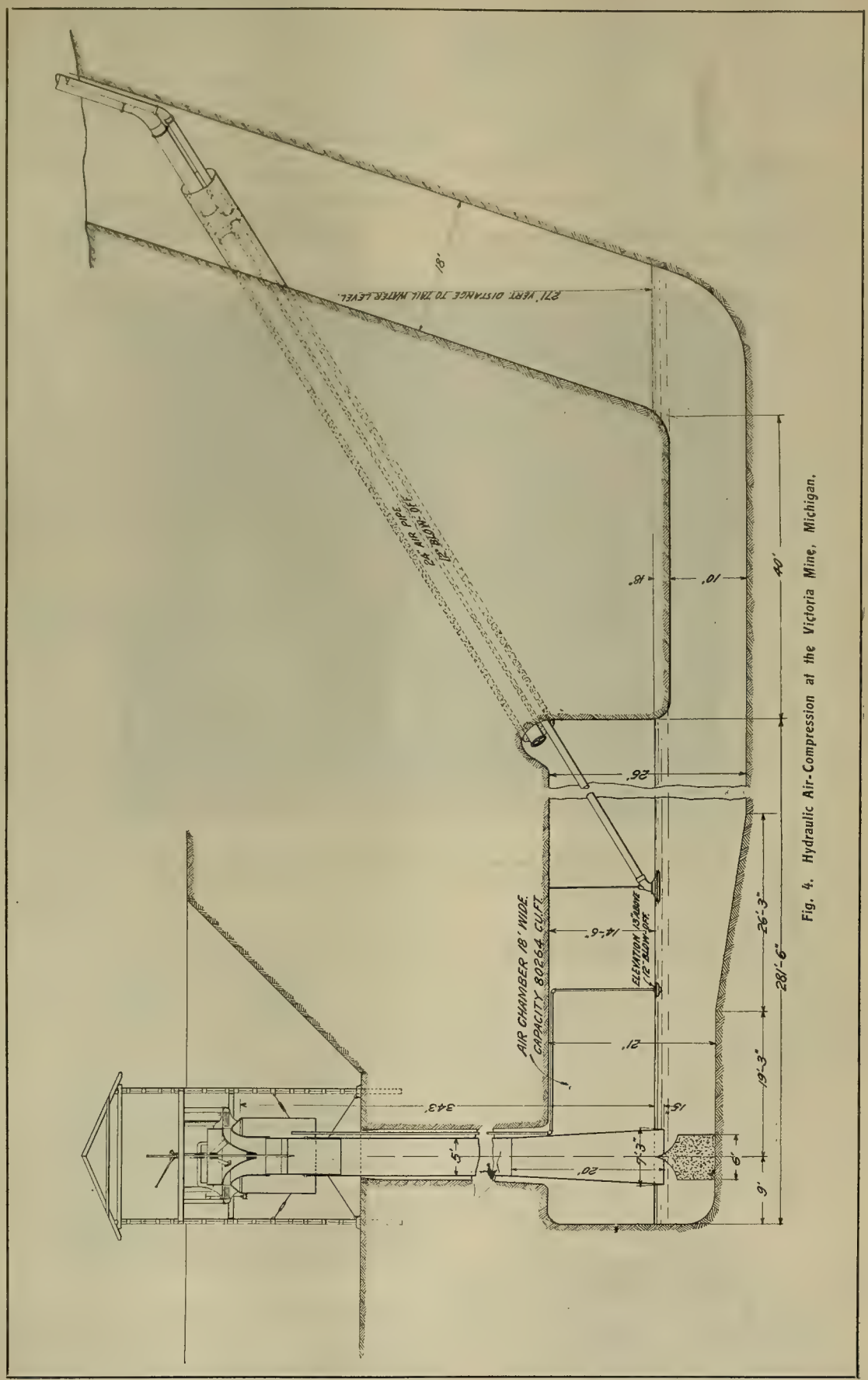


Fig. 4. Hydraulic Air-Compression at the Victoria Mine, Michigan.

1. It requires little, or no, attention.
2. There are no moving parts liable to derangement.
3. The air is compressed isothermally, therefore it does not carry any moisture, to be condensed in the air-mains and freeze in the exhaust of the pumps, drills, hoisting and other engines.
4. The air is perfectly pure, there is no smell of evaporated or burnt oil in the air used for ventilation.
5. The maintenance is little or nothing, and its durability is unlimited.
6. The high efficiency obtained from the actual power of the water.
7. It produces a power that can easily be doubled with the smallest consumption of fuel, the increased power being obtained with less than half a pound of coal per h.p. hour.
8. A power that has a storage capacity so that from 25 to 50% more power can be drawn from it for a short period than is being compressed, without affecting the pressure. In the present plant, the storage is over 80,000 cu. ft. of air at a pressure of 117 lb. sufficient to run 1,000 h.p. extra nearly two hours.



Fig. 5. Flash-light view of the three steel tubes, which extend through roof of air-separating chamber and are connected in lower end of compressor shaft. The photograph also shows the division wall between the tubes, placed there to prevent the water of one compressor from interfering with the other.

HOUGHTON, Michigan, June 9, 1906.

Mr. Thomas Hooper, Superintendent Victoria Mine, Rockland, Michigan.

Dear Sir — In accordance with your request of May 9 observations have been made to determine the efficiency of the Taylor hydraulic air compressor installed at the Victoria mine. The results of three tests are as follows:

AIR MEASUREMENTS.

Sq. ft.	Vel. per sec.	Cu ft. per min.	Absolute pressures.		Horsepower.
			Free.	Comp.	
4	44.09	10,580	14	128	1,430
4	49.74	11,930	14	128	1,623
4	38.50	9,238	14	128	1,248

WATER MEASUREMENTS.

Flume area.	Vel. per sec.	Cu. ft. per min	Head ft.	Horse-power.	Efficiency. Per cent.
71.75	3.033	13,057	70.5	1,741	82.17
67.03	3.684	14,820	70.0	1,961	82.27
72.16	2.936	12,710	70.6	1,700	73.50

Three similar heads have been installed and measurements were made of the air and water supplied to the middle head, the other two heads not running. The head to be tested was enclosed in a tight chamber and the velocity of the air, admitted through a duct two feet square, was measured by an anemometer. Within the canal leading to the penstock a flume was placed of approximately seventy square feet sectional area and water velocities across the whole section were determined by a current meter. The observations were taken May 28 and 29 by Professor F. W. Sperr.

Two tests at near the maximum capacity show the exceptionally high efficiency of 82%. The separation of the air from the water seems to be complete.

Respectfully submitted,

(Signed) F. W. SPERR,
O. P. HOOD.

THE only restriction placed by the Russian government on the private production of gold in Siberia is the provision that the gold must not be taken out of the country in its rough state. If the gold-miner sells his gold to the Government laboratory in Tomsk, or Irkutsk, he receives full value for it, both for the gold and the included silver. The payment is made at once in the form of a draft on the Government bank, which may be cashed in standard Russian gold coin, if desired. The tax of three per cent which formerly existed on gold mined in western Siberia has now been removed, and the only nominal charges are for transportation and coinage. The operator must transport his gold to the railway at his own risk, but from the railway station it is transported at the risk of the Government.

THE position of undercurrents in a placer-mining plant should be considered with care, for unless they are properly constructed and placed in the best position they will prove of little usefulness. A grizzly of steel bars, set one inch apart, must be placed in the sluice-line one inch lower than the tops of the riffle-blocks or stone pavement in the sluice. The fine material passes through, onto the undercurrent, which has a grade at right angles to the sluice. It relieves the sluice of much fine material.

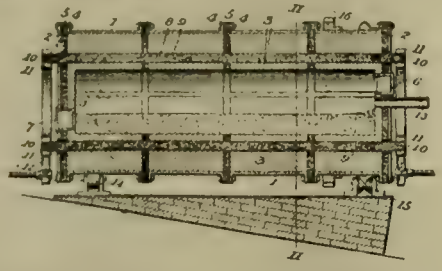
THE surest proof of the truth of scientific conclusions is the fact of their *not* being original so far as *one* person is concerned, and of their having become manifest to more than one mind, either about the same time, or successively, without communication.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

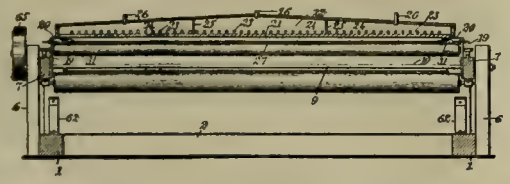
ROTARY ELECTRIC FURNACE.—No. 825,058; Woolsey M. Johnson, Iola, Kansas.

A rotatable electric furnace comprising a chamber composed of separate sections provided with refractory linings, a resistance conductor for heating said chamber, and means for rotating said furnace.



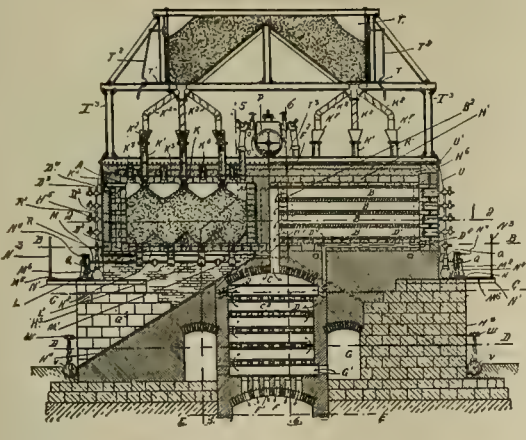
ORE SEPARATOR.—No. 825,758; Samuel J. Rogers, Bingham Canyon, Utah.

An ore-concentrating apparatus, comprising a frame having side members, an endless traveling belt supported by the frame, a pair of oppositely arranged brackets carried by the side members of the frame, adjustable guides for the edges of the upper run of the belt carried by said brackets and adjustable guides for the edges of the lower run of the belt carried by the side members of the frame.



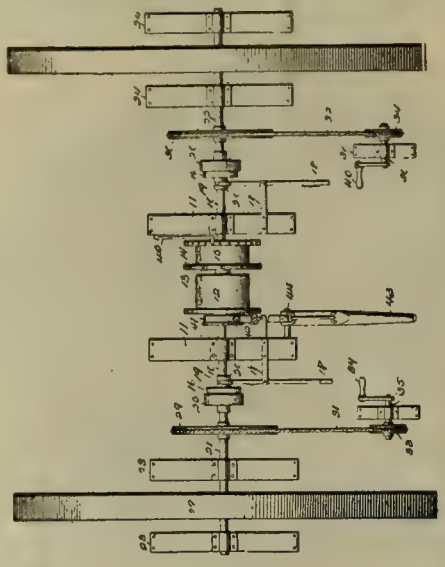
CONTINUOUSLY OPERATING RETORT FURNACE.—No. 825,536; Richard C. Hills, Denver, Colorado.

A retort furnace provided with two banks or series of horizontally disposed retorts located on opposite sides of the central part of the furnace in which are located downwardly extending exhaust flues communicating with the stack, and combustion flues interposed between the retorts and extending the entire length of both banks of retorts on one side of the latter, passing around the end of one retort on one side of the furnace and extending in the reverse direction on the opposite side of one retort and finally communicating with the said downwardly extending exhaust flues.



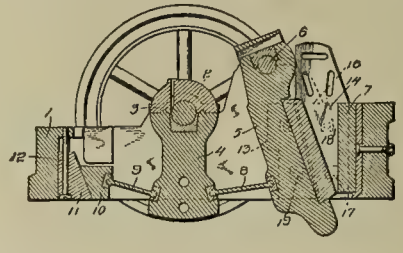
MINE HOIST.—No. 825,477; Austin B. Paige, Iowa Falls, Iowa.

In a mine hoist, a shaft having a drum thereon, bearings for the said shaft, a clutch member on the end of said shaft, a second shaft having balance-wheel thereon, bearings for said second shaft, a clutch member on said shaft, a sheave on the second shaft, a second sheave mounted on a shaft in suitable bearings, laterally removed from the first sheave, a rope for embracing the sheaves, means for rotating the said second sheave, means for moving the clutch members into and out of engagement, and a brake for controlling the speed of the first-mentioned shaft.



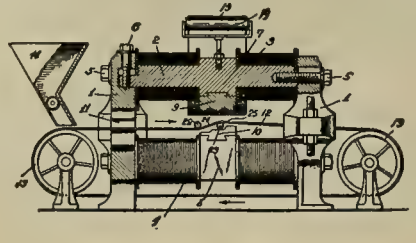
ORE CRUSHER.—No. 825,699; Isaac N. Bonsal, Oronogo, Missouri.

In a crushing machine of the character described, the combination of an open crusher-bed, a stationary jaw fixed within one end of the bed, a movable jaw working between the sides of the bed in co-operative relation with the stationary jaw, wear-plates secured to the inner walls of the bed between the two jaws, the inner walls of the bed being provided with open-ended recesses at the backs of the wear-plates, backing-plates fitted within the recesses, and removable fastenings piercing the sides of the bed and engaging in backing-plates.



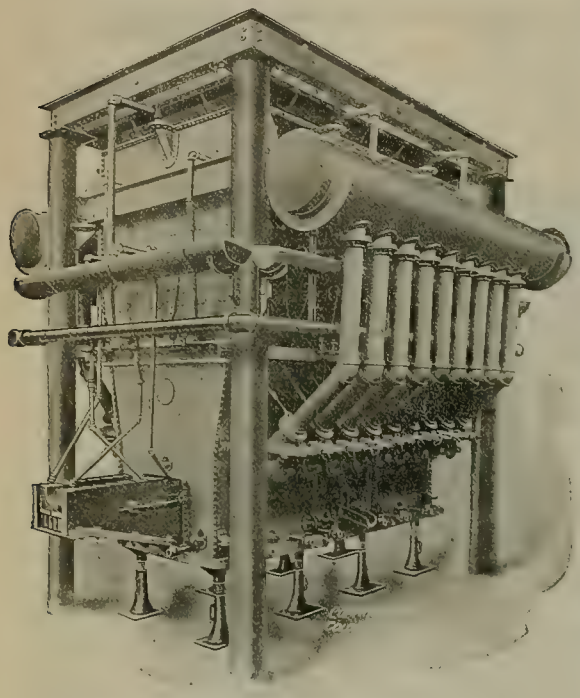
MAGNETIC ORE SEPARATOR.—No. 825,672; Richard R. Moffatt, Brooklyn, New York.

In a magnetic ore separator, the combination of upper and lower poles of opposite polarity, rectilinearly moving feed and separating conveyors intersecting each other in the interpolar space and adjustable means whereby the feed conveyor is abruptly brought into closer proximity to the upper pole at one point than at a preceding point, whereby the strongly magnetic particles are separated at one point on the separating conveyor and the feebly magnetic particles are separated at another point on the same separating conveyor.



New Copper-Matting Furnace.

The accompanying illustration represents the latest type of copper-matting blast-furnace recently built for the New World Smelting Co., of Seattle, by the Colorado Iron Works Co., of Denver. This furnace, which is now being installed at the mines near Livingston, Montana, has some new features, including angle-inlet tuyeres and combination trap-spout. There are two tiers of steel-plate water-jackets, the



Latest Type Copper-Matting Blast-Furnace.

upper one being supported independently of any other part of furnace by a steel I-beam frame carried upon brackets on the corner columns. The tuyeres shown are the Colorado Iron Works Co.'s latest type, the blast inlet entering at an angle of 45 deg., thus avoiding the sharp corner and excessive friction. The trap-spout is made of cast-iron plates, bolted together, lined inside with magnesite. The overflow end is fitted with a water-jacketed copper tip, which resists the greatest cutting effect of the matte. This furnace is 42 by 120 in. at the tuyeres and has a capacity of about 150 tons per 24 hours.

ACCORDING to the Department of Commerce and Labor $35,000,000 worth of diamonds were imported into the United States in the fiscal year 1906. No article shows greater fluctuation in the imports than diamonds. In 1906 the total, as stated, was $35,000,000; in 1904, two years earlier, only $19,000,000; in 1903, $26,000,000; in 1900 but $12,000,000; in 1897 less than $2,000,000, and in 1893 about $15,000,000. About $10,500,000 worth of diamonds imported in 1906 were uncut, to be prepared for use by the diamond-cutting establishments of the United States, while over $24,000,000 worth were cut but not set.

'ROUGH-CAST' is an external plastering in which small sharp stones are mixed, and which, when wet, is forcibly thrown or cast from a trowel against the wall, to which it forms a coating of pleasing appearance. When well executed the work is quite durable. The mortar should have some cement mixed with it.

WHERE the mine-water is acid it corrodes wrought-iron or steel pipes, so that some other metal must be used, as bronze or copper, or again, where the pressure is not great, even wire-wound wood pipes. For higher pressures, iron pipes lined with red-wood soaked in asphalt have given good results.

Trade Treatises.

THE SMOOTH-ON Co., of 572 Communipaw avenue, Jersey City, N. J., has issued the fifth edition of 'The Instruction Book,' telling how to use the iron cement—smooth-on.

STURTEVANT ENGINEERING Co., of Hyde Park, Mass., has issued Bulletin No. 137, describing the Flinn steam trap, a device to drain water, due to condensation, from steam-pipes, gauges, coils, cylinders, etc.

THE DENVER ENGINEERING WORKS has published Bulletin No. 1,027 on tube-mills, illustrated by half-tones and line-drawings, with descriptive text explaining the method of their operation and results accomplished, and working costs.

'Some Details as to Smelting Practice and Equipment,' is the title of catalogue No. 12 of the COLORADO IRON WORKS Co., of Denver, being the fifth revised edition of this interesting and valuable publication. The chapters on hot-blast smelting and copper-matting and pyritic-smelting are valuable. The book, containing 157 pages, is handsomely illustrated and is of value to all who contemplate the purchase of a smelting plant.

THE WELLMAN-SEAVER-MORGAN Co., of Cleveland, Ohio, has issued several new bulletins and circulars. Bulletin M-104 describes the copper-converters and equipment made by it; Bulletin M-103 is on stamp-mills and equipment; circular H. O.-9 describes and illustrates first motion winding engines with Corliss non-detaching valve gear, made by this company; Bulletin M-101 is descriptive of both the spring and rigid types of Akron crushing-rolls, and Bulletin M-102 is on the copper blast-furnace.

THE JAMES LEFFEL & Co., Springfield, Ohio, has issued a handsome and complete new catalogue of 52 pages, illustrating and describing its line of steam-engines and boilers. The details of construction are plainly shown and fully explained, and the catalogue is one that should be in the hands of any prospective purchaser of work in the steam-power line. A copy will be furnished free to prospective buyers, stating their wants, and addressing the company as above. In writing please request Catalogue "O."

Commercial Paragraphs.

TWO LANE SLOW SPEED MILLS have been purchased by the Wire Patch Gold Co. at Breckenridge, Colo., to crush iron pyrite to 80-mesh, and amalgamate the gold therein.

THE COLUMBIA ENGINEERING WORKS, of Portland, Ore., announces that it is prepared to give $100 cash bonus to the individual who will find a pure silica sharp sand, suitable for molding in steel foundry practice, and in sufficiently close proximity to the railroad that it can be delivered to Portland, Ore., at a price of $4 per ton, including freight.

THE TRAYLOR ENGINEERING Co. and Traylor Manufacturing & Construction Co. have been consolidated into one corporation, under the name of the Traylor Engineering Co. The consolidation is stated to be the result of the increase of the business of the Traylor Engineering Co., which made it desirable to combine the two concerns in order to simplify and expedite the conduct of their business. Under the old arrangement the Traylor Engineering Co. was the active concern dealing with the public while the Traylor Mfg. & Construction Co. owned the works at Allentown, Pa., and did the manufacturing under contract for the other.

At a meeting of the board of directors of THE COMPRESSED AIR MACHINERY Co., of San Francisco, the following officers were elected: P. H. Reardon, president; J. M. O'Brien, vice president; Eldredge Green, secretary; Crocker-Woolworth National Bank of San Francisco, treasurer. The directors of the company are: C. E. Green, manager of the Crocker Estate Co.; Wellington Gregg, Jr., cashier of the Crocker-Woolworth National Bank of San Francisco; J. M. O'Brien, president of the Humboldt Transit Co. and The Sultana Gold Mining Co.; J. E. Green, president of The Parkside Realty Co. of San Francisco, and P. H. Reardon, who retains the management.

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Editorial.

THOSE MEMBERS of the American Institute of Mining Engineers who attended the meeting in England must have had an enjoyable experience, for they were entertained hospitably, and even magnificently. Captain R. W. Hunt, the president, and Dr. R. W. Raymond, the secretary, made excellent speeches on several occasions. Six members were presented to King Edward.

THE CALIFORNIA MINERS' ASSOCIATION suffered the loss of its annual transactions, which were in the printer's hands when the earthquake-fire destroyed so much that was valuable. However, like all other Californians, the president, Mr. Alfonso A. Tregidgo, set to work at once to repair the loss, and we are glad to learn that the volume of transactions is again in course of being printed. The association has secured an office at 1428 Sutter St., and Mr. E. J. Ensign is acting as its secretary. The annual convention is to take place at San Francisco in November next.

THE IRON AND STEEL INSTITUTE, by its Council, has voted to give the Bessemer medal to King Edward, as was done several years ago to Queen Victoria. The Bessemer medal is one established to commemorate a great metallurgist and an epoch-making invention; it is given each year to the man who by his metallurgical research has best advanced the iron and steel industry. Nothing could emphasize the different notion of what is befitting—in other words, the diverse taste of cultured men—in England and America than this bestowal of the Bessemer medal on the King. He is worthy of all honor and of the affections of his people, but gold medals for metallurgical research seem to us to belong to someone else. It would be only fair if the King should graciously signify his intention of bestowing the title of Poet Laureate on each member of the Council.

IN THE current issue of *The Mining Investor* there is a long article entitled 'The Comstock in 1876'; it is an interesting article, in fact, a mighty good article, and it does *The Investor* credit. According to a conspicuous note it is "reprinted by permission from *The Engineering and Mining Journal.*" Well, the article is really a good one, and would be something for *The Engineering and Mining Journal* to be proud of. But it was not published by our junior at New York; it was written by Mr. W. H. Storms, and appeared in the MINING AND SCIENTIFIC PRESS of February 24, 1906. We are reminded of a duck story. It appears that an alleged sportsman saw some ducks in a quiet pond and asked permission of a man, whom he supposed to be the owner of the property, to shoot those ducks; which he did; and then another man, the real owner, came out with a gun and things happened. Meanwhile the man to whom the sportsman gave

$5 for permission to shoot, was far away. Moral: Get permission from the right fellow.

UNDER SPECIAL CORRESPONDENCE we publish this week a letter from Redruth. The letter makes no particular pretensions, but it is interesting as coming from an old mining centre. Redruth is not only that; it is more; it has been the cradle of mining to many generations of men. What London is to the financier, Paris to the dressmaker, New York to the hotel-keeper, and Boston to the really intellectual, that Redruth is to those who use the pick and gad. One of the sulphides of copper is called 'redruthite,' to emphasize the fact that at one time this Cornish town did the business of a great copper industry. But even mines peter out. Redruth lost her importance as the workings penetrated through the slate into the granite, the copper giving out as the tin came in, but not as richly. Nevertheless, with that dogged perseverance that makes the Cousin Jack a great miner, the local shareholders held on, deepening their shafts and extending their explorations underground until a depth of 3,000 feet was attained. Lately there has been a revival, for the price of tin has risen to an unprecedented figure and one or two discoveries, particularly in that famous old mine, Dolcoath, have stimulated the interest of the financial world at London. So Redruth, overlooked by Carn Brea, and looking toward the tempestuous shore at Porthtowan, is again in the minds of mining men, from Alaska to Patagonia, from Korea to South Africa. Many a Cornishman having his 'croust' in a quiet cross-cut, munching the 'pasty' that has sustained the energy of generations of 'tributers,' will speak of the old town and revive the memories of a youth in the West Country.

Mining at Its Best.

The annual report of the Wolverine Copper Mining Company affords an example of good clean business, the kind that lifts mining from a vulgar gamble to a great industry. It is shown that 355,339 tons of ore were treated for a yield of 9,681,706 pounds of refined copper, which was marketed at an average of 17.17 cents per pound. The ore gave 28.32 pounds of refined copper per ton, equivalent to 1.416 per cent; the cost at the mine amounted to 5.47 cents, and the cost of smelting, freight, and marketing at New York was 1.03 cents, so that 6.5 cents per pound represents the total working expenditure; to this, 0.26 cent is to be added for construction. Thus the profit was 10.41 cents per pound, or 60 per cent of the gross yield. This is splendid work, the excellence of which is emphasized by the further statement that the total working cost was only $1.49, on an ore yielding $4.04 per ton. What the gross value of the ore was, it is difficult to say; for the loss in milling is not known accurately. The best work in the Lake Superior stamp-mills represents an extraction of 80 to 85 per cent; so that the crude ore was worth about $5 per ton.

Apart from the highly profitable result of operations as disclosed in the report, the document is a model in its brevity, conciseness, and completeness of information. To John Stanton, the founder of the company, whose useful career closed a few months ago, is due the high character of the management at this, and several other mines, in the copper country of Michigan. No finer legacy can be left by a man to his sons, and to other men's sons, than this — a continuity of honorable business practice.

The Transvaal Constitution.

We have nothing to do with politics, but we take a keen interest in the industrial welfare of the great mining regions of the world; this is our excuse for referring to a political matter of paramount interest. From telegraphic despatches we learn that the statement of the British Government's intentions in regard to the new Constitution for the Transvaal has caused much uneasiness in that department of the London Stock Exchange devoted to 'Kaffirs,' or South African mining shares. It is the general expectation that the manhood suffrage to be granted to the Colony will give the British residents a slight preponderance over the Boers in the new Parliament of the Transvaal, but all of the majority will not necessarily be allied to the mine-owners, so that the result of legislation is uncertain. Our Johannesburg correspondent, in his letter published in our last issue, expresses the irritation felt at the actions of the Liberal Government and he emphasizes the impossibility of any revival in mining speculation until the labor problem receives definite solution. The recruting for coolies in China will cease on November 30 and it will be open for the new legislature in the Transvaal to pass another labor ordinance. But the British Government reserves the right to veto laws that impose any disability on immigrants, so that coolies appear likely to be barred, and on the other hand the African States, like those of Australia, will oppose any step enabling the Chinaman to enter the country as a free man.

Another awkward matter awaits solution. By the Vereeniging conference, at the close of the war, it was agreed as one of the terms of peace that the right to vote should be withheld from the native and colored population in the Transvaal. It is notorious that many of the Boers are partly of African descent and among them this stain is not considered as disgraceful as among Europeans. Yet it will be difficult to make distinctions. If the right to vote had been conditioned on a property qualification, however small, it would have been possible to avoid this dilemma. As it is, with self-government based upon manhood suffrage without proportional representation, it is quite on the cards that the Boers may get the reins of power, an event that would revive all the knotty problems cut by the sword. The Boers are in a minority of 20,000 on a total of 90,000, yet, by reason of the distribution of representatives, there is a chance that they may get a majority of two or three in the new Parliament. The history of South Africa has been a record of great blunders. To those at a distance it would seem that the British Government has incurred the unnecessary risk of another political tangle fatal to the peace and prosperity of the Transvaal. No wonder the Kaffir market is tremulous.

By the Way.

REFERRING to the question of Chinese labor on the Rand and its bearing on the future of the gold mining industry in the Transvaal, we quote from a dispatch to the British Foreign Office, sent by Lord Selborne, the Commissioner to South Africa. He says:

The African supply of labor, even including that from Portuguese East Africa, has long been insufficient to meet the ever-growing demand of the Transvaal. And the more the general prosperity of the Transvaal increases the less does the native labor supply suffice to meet its requirements.

It was this dearth of native labor which led to the introduction of Chinese labor to supplement the deficiency of native labor for the mines. And here I would respectfully protest against the view that the importation of Chinese coolies was only intended to bring the mining industry back to the position which it held before the war. That was a position from which, so far as can be judged by all the available evidence, it could never have advanced if it had been wholly dependent upon the native labor supply.

It can hardly be repeated too often that the existing industrial organization, to say nothing of the existing machinery of government of the Transvaal, could not be justified if the position of the gold mining industry, at the highest point to which it has hitherto attained, is to be taken as its permanent high-water mark.

Unless this expansion is allowed to proceed regularly and without any artificial check, both Government and industry will find themselves confronted with a serious crisis, the least effect of which will be to curtail greatly the sphere of usefulness of the Government and to close down many of the works of the industry.

This deplorable state of things would arise from the fact that the mining companies, in anticipation of the regular supply of labor which they require, have embarked on an enormous expenditure, in the way of development work, and of enlarging their sphere of mining operations, the whole of which expenditure would be thrown away if the regular supply of labor upon which they have reckoned were to be checked. I am not yet in a position to state with any accuracy what this expenditure amounts to, or what may be estimated as being the ultimate effects of the loss of it.

But I will give, as an instance of how the sudden curtailment of the labor supply would affect the mining industry, the following figures, which have been furnished to me by the Chamber of Mines: Of the Chinese coolies, for whose importation licenses have already been issued, but who have not yet arrived in this country, 11,700 have been ordered for the Consolidated Gold Fields group, the Eckstein group, the East Rand group, and the General Mining & Finance group. In anticipation of the arrival of these 11,700 coolies, the four groups which I have named have actually incurred or are on the point of giving orders incurring an expenditure amounting to not less than £2,000,000 for machinery and plant, and for the erection of compounds for Chinese and quarters for married and single white workmen.

You will notice that throughout the foregoing I have been dealing with the gold mining industry only. I have said nothing about the labor supply which may be required in the future to develop the other mineral resources of the Transvaal, in the shape of coal, tin, copper, or asbestos. Information is not yet available which would enable me to speak with certainty as to what the potentialities of the Transvaal are in the way of tin or asbestos, but I am quite sure that they are great. In addition, the Premier diamond mine has now reached a stage of development at which an increase in its supply of labor, and a large increase, is urgently required. It is worth while here to mention that the governor of Cape Colony informs me that the Kimberley diamond mines are short by several thousands of the number of native laborers they require. I understand also that Natal still requires more Indian coolies for agricultural purposes. This shows that this deficiency of labor for industrial and agricultural development is universal throughout South Africa. Agriculture, indeed, cries out everywhere for labor, and will find it even harder to satisfy its requirements than it does at present if the mines, through the stoppage of their Chinese labor supply, are driven to strain every nerve to draw labor from agriculture to mining.

Everywhere, in the Orange River Colony and Transvaal alike, the farmers ask me insistently for more labor, and already several of them have formally asked leave to import coolies under a system of indenture as in Natal.

SPEAKING of scientific research, Mr. Charles W. Eliot, president of Harvard University, said: The public needs to obtain a clearer idea of scientific research, of its objects and results, and of the character and capacity of the men who devote themselves to it. The public has also been long interested in the inventor's resourceful and persevering habit of mind—the inventor who is trying to make some new application of acquired knowledge, or to discover a new fact or principle which can be put to commercial use. But scientific research is somewhat different from these other kinds of research. It has deep roots in the past; but its object is never to demonstrate merely what has been done or said, or to obtain a monopolistic profit. Invariably its object is to extend the boundaries of knowledge, and to win new power over nature. It is not chiefly concerned to enlarge records of the past, or to make them more accurate, but rather to use all the powers the past has conferred on the human spirit to win new power. The past gives the scientific investigator his lever and the present his fulcrum; but his work is to take effect on the future, and is to give him or his successors a stronger lever and a better placed fulcrum. As a rule, scientific research is carried on with no public observation, and as silently as nature elaborates and throws out the mantling verdure of spring; but in a country which has already reaped great benefits from the endowment of institutions of education and charity by public-spirited persons, it is fitting that the beneficent work of the scientific investigator should be accurately described, and commended to the favor of an enlightened public opinion.

Let us first consider what mental habits and powers the scientific investigator needs to have acquired and to keep in exercise, or in other words what sort of a mind the investigator ought to have. In the first place, he needs the faculty and the habit of determining and grasping facts, and then verifying and digesting them. He must next be capable of conceiving hypotheses which will connect his facts, or explanations that will group them or arrange them in a series. These hypotheses or explanations will come to him as results of reflection or of imaginative scheming; in the common phrase, ideas will occur to him. A preconceived idea may be a great power in experimental researches; but the inquirer must have the habit of pursuing to verification or disproof all such ideas. He must test them by new experiments contrived for that purpose. He must exhaust all the adverse hypotheses which come to his mind. He must always keep in the road that leads to truth, although he does not know just where the truth lies.

If through the play of his imagination he gets off the right road, his rigorous experimentation must bring him back to the safe path of the inductive method.

Special Correspondence.

REDRUTH, Cornwall, August 5.

The mines now in operation in the county represent but a small proportion of those working 40 or 50 years ago. Their principal product at that time was copper ore, but of the mines that extended from east to west of the county, none are now working exclusively for that metal. Tin has been for many years the only product of importance (excepting a little lead and other ores) and generally, but not always, it has succeeded copper in depth on the lodes, as they penetrated the granite formation from the overlying clay-slate (killas), especially in the western part of the county.

The present field of operation is confined chiefly to the mines situated around the base of Carn Brea, between the towns of Redruth and Camborne; these mines are considered deep, the present workings being from 1,000 to 3,000 ft. below the surface. The lodes, although fully maintaining their width, have not, for many years, been rich, the tenor of the ore varying from 30 to 40 lb. of tin oxide per ton of ore extracted; there has been also a notable absence of rich runs or columns of ore-ground with but few exceptions, and this, together with increased expenses, has, at moderate prices for tin, rendered working generally very slightly remunerative. Very fortunately the great advance in the price of the metal has, for the time being, put new life and energy in the working of existing mines, enabling them to work profitably and to push forward exploratory works, which for lack of means had been neglected or carried out on too small a scale. The advance in the price of tin has had the effect of opening up, in some cases, old mines, or parts of abandoned sets considered under present conditions to present good chances of success; among these may be named Condurrow, near Camborne and Wheal Vor to the west of that locality. It is, however, a notable fact that no new discovery, apart from known runs of lodes extensively worked, has been made.

Quite a new feature in Cornish mining is the successful application of electricity as motive power, it being applied at the Tywarnhaile mines in the Porthtowan district in re-opening these extensive copper mines. There does not appear to be much outside capital coming into the county notwithstanding that good profits are now being made in some of the old mines, the famous old Dolcoath having just announced a dividend of 15% on the last half year's operations. The main reason is that the formation of companies with moderate capital, mainly to be spent on the mines, does not present sufficient opportunities for stock exchange operations.

CALUMET, Michigan, August 18.

A drill cross-section of the Keweenaw Copper Co.'s lands, near the Mandan and Resolute properties, has been completed, and the diamond-drill work will now be devoted to what is known as the Empire tract. A shaft on the old Medora property, sunk in what is called the Medora vein, has been cleaned out, and the showing is excellent, the rock being of a good grade for stamping. The lode also contains some heavy copper. This formation also traverses the Keweenaw Co.'s lands for nearly four miles, so there is room for a large mine if the copper is there in paying quantity. The Medora lode parallels the Greenstone bluff at a distance of 800 ft., and 900 ft. further south is situated the Montreal river amygdaloid, which is giving promise on the Calumet & Hecla's Delaware property, where three shafts are in operation.

The Home office of the Lake Superior & Arizona Mining & Smelting Co., in Calumet, has a telegram from the superintendent, A. C. Sieboth, at the mine, near Superior, Arizona, to the effect that the sulphide zone has been entered, which had long been searched for. In the upper levels there are large areas of good oxide ore blocked out, but it was the desire of the management to find the sulphide before starting work on a smelter. If it is proved that the sulphide zone which has been entered is permanent, the company will erect a smelter and build a tram to connect the mine with the railroad, 25 miles distant.

The site for the vertical shaft that the Hancock Consolidated Mining Co. intends to sink, has not yet been decided upon. The purchase of the surface rights of the Anthony farm, comprising 200 acres, beneath which the Hancock Co. already owned the mineral rights, simplifies the situation. The vertical shaft will reach the Pewabic and other lodes. John L. Harris, superintendent, has engaged John Peterson as head mining captain, in which capacity he was formerly employed at the Winona for a number of years. Charles W. McDougal is chief engineer. He was formerly on the engineering staff of the Quincy Co. Fred Schubert, who also had experience at the Quincy, is surface and construction engineer for the Hancock. There have been several railroad surveys made to determine the most advantageous route over which the Mineral range may build its spur to the Hancock mine. Probably it will not be decided until the company determines upon the site for its vertical shaft. The Hancock now employs 30 men. A hoisting engine, capable of operating to a depth of 2,000 ft., is being built at Marquette and an air-compressor will be bought from the Sullivan Machinery Company.

At No. 2, the new shaft of the Baltic mine, 400 tons of ore are hoisted daily. The other shafts are not producing quite so much as formerly. The mill is now stamping but 2,000 tons daily. The Wolverine mine has increased its ore shipments to 1,150 tons daily, which is the maximum capacity of its stamp-mill. The yield of refined copper per ton of rock stamped shows no diminution.—— Captain Thomas Hooper, who resigned as superintendent of the Victoria mine a short time ago, has been tendered seven different executive positions. He is one of the pioneer mining men of the district.

The Wolverine Copper Mining Co. publishes its annual report and gives some interesting figures. The following is a summary of the year's business:

RECEIPTS.

9,681,706 lb. copper @ 17.17 cents		$1,662,142.87
Interest		11,044.14
		$1,673,187.01

EXPENDITURES.

Working expenses at mine as per statement hereafter	$529,668.40	
Smelting, freight, and all other New York and Boston expenses	99,729.83	629,398.23
Leaving a mining profit of		$1,043,788.78
There has been expended for construction	$24,814.68	
And for timber lands	11,154.00	35,968.68
Showing a net profit of		$1,007,820.10
Surplus from previous year was		821,361.54
		$1,829,184.64
Less dividend October 2, 1905	$360,000.00	
Less dividend April 2, 1906	480,000.00	840,000.00
Leaving a surplus June 30, 1906, of		$989,184.64

SUMMARY OF RESULTS.

Ore hoisted	355,389 tons
Ore stamped	341,820 tons
Product of refined copper	9,681,706 pounds
Yield of rock treated 28.32 lb. per ton, or	1.416 per cent
Cost per ton of ore hoisted	$1.49
Cost per ton of ore stamped	$1.54
Cost per pound of refined copper at mine	5.47 cents
Cost of smelting, freight and marketing product, including New York office expenses	1.03 "
Total cost per pound of refined copper	6.50 cents
Total cost per pound of refined copper, including construction	6.76 "

Salt Lake City, Utah, August 18.

The ore and bullion settlements reported last week were $519,800, and during the same period 146,200 shares of stock were sold on the floor of the Salt Lake Stock & Mining Exchange for $109,029.

A body of galena has been encountered on the 800-ft. level in the Cyclone mine at Stockton. It has been cross-cut 11 ft. The management of the New Stockton mine has cut its first sulphide shipping ore on the 1,000-ft. level, directly under one of the five shoots opened on the 850 level. The management of the Southport Mining Co. announces that arrangements have been made to develop its property through the Honerine drain adit. W. C. Alexander, the manager, says he will ship ore before the close of the year. Power equipment is to be installed.

Twelve Utah mines posted dividends during July, eight of which represented the Tintic mining district; they were: Beck Tunnel Con., $25,000; Mammoth, $20,000; Grand Central, $15,000; Victoria, $10,000; Bullion-Beck, $10,000; Yankee Con., $15,000; Uncle Sam Con., $5,000; Carisa, $5,000. Park City was represented by the Silver King, which paid $50,000; Mercur, by the Consolidated Mercur, $25,000; Fish Springs district by the Utah, $2,000; and Bingham by the Bingham & New Haven, $22,600.

The Kimberly Nevada Gold Mining Co. has been organized here to operate at Gold Butte, Nevada. O. Wiser of Kimberly, Utah, will be manager. An order for hoisting equipment will soon be placed. —— Application has been made for the establishment of a postoffice at Pine Grove, Beaver county, where the Pine Grove Mining Co. has about completed a mill of 40 tons daily capacity. —— The Blue Point Copper Mining & Milling Co. has been organized to operate in the Bradshaw district, Beaver county. E. J. Raddatz is president, and F. M. Davis, of Salt Lake, secretary and treasurer.

Improved conditions are reported from the Stateline district, where several properties are shipping, and at no time in the history of the camp has so much prospecting work been in progress. —— The ore shipments from Park City this week were 1,986 tons. The Daly-Judge shipped 813 tons; Daly-West, 400 tons; Silver King, 496 tons; Little Bell, 235 tons; Kearns-Keith, 25 tons; other mines, 17 tons. —— The West Quincy and Wabash companies, operating at Park City, have levied 10c. assessments.—— The management of the Ontario Silver Mining Co. reports good progress in re-opening the drainage adit, closed for the past 18 months. The drift runs parallel with the main adit through hard formation for a long distance, and is believed to have passed the caved portion; a cross-cut is now being run to make connection and release the backed-up water. With the re-opening of the adit, resumption of mining on the lower levels of some of the big mines of the district will be possible. —— Development work has been suspended indefinitely at the Diamond-Nimrod property at Park City, which was controlled by Colorado Springs parties.

The Columbus Con. at Atlas is shipping ore which returns about $40,000 monthly. The ore sells for $50 per ton and the mill product for $14.

Ore assaying from $40 to $50 per ton is coming from the Wyoming mine of American Fork canyon. —— At the Tetro mine, in Tintic district, work is being pushed in the cross-cut from the new shaft to the orebodies, which will probably be erected in another 125 ft. —— Good results are reported in the development of the Mammoth mine in the Tintic district at depth. Shipments coming from the 2,260 level show 9.5 oz. gold and some silver, bringing the valuation up to $187 to the ton.

At Bingham a significant strike of copper ore has been made in the Andy adit of the Utah Apex mine. The vein is 20 ft. wide, four feet of which is shipping ore, principally gray copper and bornite. The Apex Co. is installing an aerial tramway and will soon arrange for the mill equipment. —— The annual meeting of the Ohio Copper Co., of Bingham, has been postponed until August 29. At this meeting, aside from the election of a board of directors, the question of incorporating under the laws of another State will be discussed. The management has begun sinking to explore the property at depth and is now in the market for power equipment.——The Century Gold Mining Co., operating in Park Valley mining district, has again started its mill.

The sampling mills of the Salt Lake valley are crowded with business and the two custom plants are preparing to enlarge. No such demand has ever been made upon the sampling concerns before. This is an index of the general prosperity prevailing throughout the mining regions tributary to Salt Lake City.

Denver, Colorado, August 18.

The Consolidation of the Good Hope, Vulcan, Mammoth, and Chimney mines, situated at Vulcan camp, in the Gunnison gold belt, is an important event, for it will put a stop to litigation that has been brewing for a long time. There is nothing that gives a camp a greater setback than a big lawsuit, so it is an important matter when one of these big parasites is nipped in the bud. Just how much money changed hands in this transaction is not given out, but securities to the value of $330,000 changed hands, and the Good Hope-Vulcan Consolidated Mining & Reduction Co. was formed.

Oil in paying quantities has been struck over the range, in the new Rangely oilfield in Rio Blanco county. The field is only about 15 miles from the Utah-Colorado line. Six wells have been sunk to a varying depth, from 600 to 2,600 ft. Five of these have struck small flows of oil, but none of them have got a large flow as yet. The best flow is ten barrels per day, which, I understand, may be called oil in paying quantities. The oil has a paraffin base and is of an excellent quality. The Moffat road is to be built within seven miles of the heart of the district. The opinion is expressed by a man who has studied the district that there will be many wells that will get a small and steady flow of oil, but few that will get a large flow, the reason being that the oil-bearing strata are thick, aggregating some 1,500 ft., but they are compact and do not part with their oil rapidly. There is one conglomerate bed that is expected at a depth of 3,000 ft. that may yield a rapid flow. None of the wells have penetrated this stratum as yet.

The deal on the famous old Sunnyside has finally fallen through. Old Judge Terry is very stiff in his price and will grant no concessions whatever to a prospective purchaser. In this case the price was a million dollars, and the property was examined exhaustively by Forbes Rickard of Denver and R. M. Atwater of Helena, Montana. These gentlemen called in other noted men to pass on particular points. Rumor has it that both reports were favorable, but I guess the ore blocked out was pretty close to the danger line in quantity; so, rumor goes on to say, Judge Terry was asked to grant time to develop a little more ore, but he would not do so. The prospective purchasers were Pittsburg people.

The Almaden Mines Co., whose property is situated on Fall river about five miles above Idaho Springs, is about to purchase a mill and compressor plant. This enterprising company is composed of Kansas farmers; they took up the old Phillips property and have pushed a tunnel in at the bottom of the hill a distance of about 800 ft.; they intend going on into the hill another 1,000 ft.; they have taken out some of the handsomest native silver specimens that have ever been produced on Fall river. If

they are as lucky as the Kansas farmers that opened up the summit deposit on Gold Hill, Cripple Creek, and then sold out to W. S. Stratton, they will soon all be wealthy.

Speaking of Cripple Creek, Sherwood Aldrich has at last been forced to 'stoop to conquer' on his famous drainage tunnel scheme. Unless something unforeseen happens, the long Window Rock bore will be abandoned and an intermediate adit started very soon.

TORONTO, Canada, August 17.

The manager of the Montreal-Cobalt Co. reports that in the course of operations a gold-bearing vein has been struck yielding at least $1,000 per ton. Ore containing molybdenum and gold has been found in the Net Lake district, near Temagami, some 20 miles south of Cobalt and within the Huronian range. A number of claims have been taken up and are being developed. The discovery is confirmed by L. O. Armstrong, colonization agent of the Canadian Pacific Railway, who recently returned from a visit to the district.

Interest in the Chibugamoo gold region of Quebec has been revived by the return to Montreal of Peter McKenzie, of the Chibugamoo Gold & Asbestos Co., and H. Massam, of Montreal, after an extended visit to the district, bringing with them numerous samples of rich ore. Mr. McKenzie states that so far there has been but little actual mining done, the work having been confined to prospecting, at which there are some 20 companies at work. Over 700 square miles are under prospector's license. All of these companies have succeeded in finding valuable minerals of some kind. The Chibugamoo Co. has made many open-cuts and has begun the sinking of a shaft. In the open-cuts the ore averaged $11 per ton in gold and about $50 in copper. The averages in the shaft were $24 in gold and $56 in copper. A 12-ft. vein of nickel-bearing pyrrhotite has also been opened up. There is also much magnetic iron ore in the neighborhood, some deposits being found in the territory of the Chibugamoo Co., and the claims staked by Mr. Massam. Much of it contains as high as 70% iron. A fine quality of chrome iron ore has been found on Lac Doré. The rapids on the Chibugamoo river could be utilized for the furnishing of electric power.

James Ross, president of the Dominion Coal Co., has been on a tour of inspection of the collieries near Sydney, Nova Scotia, and is dissatisfied with the condition of affairs. The output shows a marked decrease, owing to the difficulty of securing an adequate supply of labor. A number of the miners have left for the West. Mr. Ross has made a number of changes in the official staff, abolishing some departments and amalgamating others.

Continued activity prevails in the gold-mining areas of northwestern Ontario. The St. Anthony's Reef mine, owned by the Jack Lake Gold Mining Co., in the Sturgeon Lake district, has yielded $7,000 in gold as the result of a two weeks' run of the stamp-mills. The shaft of the Baden Powell mine, Eagle Lake district, is down 140 ft., at which level the vein that was only 10 in. wide at the surface has widened to four feet without decreasing in richness. The force at work will be augmented next month. The Detola Development Co., whose property adjoins the Paymaster mine in the Manitou Lake region, promises well. Initial work done under the supervision of the director, John E. Burns, showed that ore from the five veins traversing the property pans freely, visible gold being present in some cases. A shaft has been sunk to allow more thorough testing. A large party of Michigan and Ohio stockholders visited the property recently.

The W. L. McCulloch Co., of Ypsilanti, Michigan, George E. Good, president, is installing an ore pulverizer near Kenora in the Lake of the Woods district. The new plant is claimed to be more economical than the ordinary stamp-mill.——Horace D. Mayhew, son of President Mayhew, of the Cape Breton Coal, Iron & Railway Co., committed suicide on the 11th inst. at Mira, Nova Scotia, by cutting his throat. Mr. Mayhew resided in England and the deceased represented his extensive interests in Canada.

JOPLIN, Missouri, August 18.

The highest price reported paid for zinc ore last week was $48 per ton, on an assay basis of $42 to $45 for 60% ore, the same as the previous week, although there was a slight advance in the average price. The output was not quite so large owing to heavy rains. Lead ore sold as high as $78.50 for a few choice bins in the Webb City district. The lead production was never greater than at present, and the price remains stronger than at any time in the history of the district. The shipment for last week was: Zinc ore, 10,906,340 lb., valued at $240,116; lead ore, 1,460,820 lb., valued at $55,355. —— The Anderson Mining Co., operating on the Granby Mining & Smelting Co.'s land at Chitwood, has encountered a good run of zinc ore in sinking a new shaft. This ore was struck at a shallower depth than the drill had shown when the lease was drilled some time ago, and the shaft will be sunk to the lower run before the upper run is developed. —— The Isabella mine, at Alba, owned by the Federated Mines & Milling Co., managed by Allen Hardy, Sr., one of the largest operating companies in this district, made its initial turn-in last week, amounting to 58,390 lb. of zinc ore. ——The Chapel Mining Co., operating near Porto Rico, east of Joplin, made its first turn-in last week amounting to 166,080 lb. of zinc ore. This company owns the lease of a large area in that part of the district, having only recently acquired it, and put down several drill-holes, finding ore in nearly all of them. A shaft was sunk and a 300-ton concentrating plant was erected; to this an addition is now being made.——The General Zinc & Lead Co.'s turn-in of lead for last week was 249,770 lb. from its lease near Prosperity.

The largest mining deal made this year was closed Monday, when the Center Creek Mining Co., of Webb City, transferred part of its holdings, the Morgan 40-acres lying north of Carterville, to S. Y. Ramage, of Oil City, Pa., for $110,000 cash, probably the largest price ever paid in this district for a 40-acre lease on which there were but two shafts and one mill. The Center Creek Co. tested the land by drilling 40 holes, all of which showed ore averaging from 10 to 14 ft. in thickness, and all above the 160-ft. level. The ore is in sheets. After learning what a large area of ore they had, two shafts were sunk, one for hoisting and the other for air; a mill was erected and three months ago they began producing, and every week since they have averaged between 80 and 90 tons of zinc ore. The Center Creek Co. has also given a 60-day option on the fee of the 40-acres to Mr. Ramage, the price being about the same figure as was given for the lease. Another big mill will be erected on the lease by the new company.

The properties of the Ohio, Royal, Egyptian, and Square Deal Mining companies, operating in the Webb City-Carterville district, have been consolidated under one management. The parent company will be known as the Ohio Con. Lead & Zinc Co. This company, or a number of the stockholders, has purchased 53 acres of the Scott land lying south of the Egyptian at Porto Rico. Seven drill-holes put down on this land recently, show a fine run of zinc ore at from 196 to 210 ft. —— The Criterion Mining Co., operating near Porto Rico, is planning the erection of a 400-ton concentrating plant to be operated by electricity. Except for the Underwriters 1,000-ton mill, at Webb City, this will be the largest electrically operated mill in the district.

London, August 8.

When those now departed heroes of finance, Cecil Rhodes and Alfred Beit, with others of less fame, worked out their schemes for the control of the diamond mines at Kimberley, they recked little of the British income-tax collector. De Beers Consolidated Mines, as a company registered in South Africa, was not in those days considered to come within the Income Tax Act as residing in the United Kingdom. But if the income-tax wheels grind slowly they have been grinding pretty surely of late years and at last De Beers has been added to the list of cases won by the Government on the ground that a company resides for purposes of income tax where its real business is carried on. Although the head office is formally at Kimberley and the general meetings have always been held there, it is established finally in the House of Lords, on an appeal from an order of the Court of Appeal, that the majority of the directors and life governors live in England, that the directors' meetings in London are the meetings where the real control is always exercised in practically all the important business of the company except the mining operations, and consequently the company's centre of trading is in England under the protection of English law.

The report of Tanganyika Concessions Ltd. shows that some further progress has been made in carrying out the ambitious programme for which the company was formed in 1899 with a nominal capital of something over half a million sterling in shares of £1 each. The interests involved are rightly declared as vast. They include a concession on Lake Tanganyika at the projected terminus of the Cape to Cairo railway, copper mining claims in northwestern Rhodesia, the Benguella mineral rights over a large area in Congo Free State, and the construction of the Lobito Bay (Benguella) railway. The principal mine now worked for gold is the Ruwe, which has given a total production to May last of 9,175 oz.—interrupted for part of last year by a shortness of the food supply. Development work upon the lode has been carried on at water-level for over 800 ft., and boring by diamond-drill is proceeding in order to prove this bed in depth. By the middle of next year the Rhodesia railways are expected to be within 300 miles of Kansanshi by a motor-road which is reported as practicable and good for all except the wettest months of the year. The engineer states that so long as the lodes maintain their present strength the Kansanshi mine will yield upward of 100,000 tons of ore for each 100 ft. in depth, and so far it runs about 20% copper per ton. The present intention is to develop the mine to 300 ft. deep, and every effort is being made to augment the machinery.

In the way of transport, something like a record has been achieved in connection with the Ruwe mine. There were 1,200 miles to traverse, and the wagons, with 320 light rails and four trucks, which left Benguella on May 2, arrived at the mine on December 24. Such difficulties of transport are likely to hamper the company's operations for some time to come, but this fact does not prevent the shares from being dealt in at a large premium. Following South African traditions, although without any prospect of dividends in the near future, the stock was engineered to as high a figure as £25, but unable to withstand the general slump, the price fell to under £4, on which an improvement has taken place since the issue of the report. Another big enterprise which has suffered severely from the South African situation is the Central Mining & Investment Corporation, familiarly known as the 'Six-Million Trust,' a reconstitution in May, 1905, of African Ventures Syndicate, itself formed some two years earlier. One of the objects of the Trust operated by Wernher, Beit & Co., as managers, was to support the Kaffir market, which in spite of their powerful assistance continued on the down grade to such an extent that the Trust has had to set aside the large sum of £1,449,000 for depreciation on the basis of market prices at the end of June. Needless to say the Trust stock itself has meantime been subject to a heavy fall below par.

In describing the policy of the Company at the recent general meeting, Sir Julius Wernher said that "they proceeded slowly and cautiously to buy certain interests partly developed, and partly in course of development. They were buying in a falling market, but the collapse which followed was quite beyond human foresight. The war had disorganized the industry to a greater extent than was realized at first, when people returned, after a long exile, full of hope. The greatest difficulty was the impossibility of getting sufficient unskilled labor." Referring to the fact that most of the mines now gave a lower return, Sir Julius thought their main hope lay in a substantial lowering of working costs and prolongation of 'life.' As a proof that it hardly looks as if the Government intends to abolish Chinese labor, the story goes that the Chinese regiment (among others) has been disbanded, but, at the same time, all the officers of the regiment—and also all officers who have qualified as interpreters of the Chinese language—have been apprised by circular of the fact that the present Government proposes to appoint several inspectors of Chinese coolies in South Africa at £800 per annum, and will be glad if all officers conversant with the Chinese language will apply for appointments.

The better news to hand during the past week as to developments at depth on the Great Fingall (W. A.) would seem to point to the realization before long of the improvement at the No. 13 level anticipated in the manager's report, to which attention was drawn in my correspondence of April 25. The winze from the No. 12 level at 580 ft. north has been put down 222 ft., the average value for the last 36 ft. being 32s. 6d. per ton for a width of 5½ ft., while the cross-cut to foot-wall 200 ft. below No. 12 level north shows the reef to be 11 ft. wide and to assay 34s. per ton. On the No. 11 level, too, the raise at 215 ft. south has been extended 54 ft., the assays averaging 33s. 3d. for a width of five feet.

Progress reports arriving from Mexico continue to be favorable to mining speculators in that quarter. With regard to El Oro, Mr. Raymond, the general manager, cables that in a drift south from the shaft on the 1,000-ft. level of the San Rafael vein, he has encountered an orebody five feet wide, composed of quartz and slate mixed with pyrite having an average assay-value of 20 dwt. per ton. He states the vein is not well defined, but is showing great improvement and that indications are favorable. Dolores cabled returns for June—gross value $48,500 from 1,150 tons treated with profit of $27,500—while marking progress, is somewhat disappointing to stockholders as showing that the mill is not yet running to its full capacity although crushing was started more than a year ago. It is understood, however, that the returns are likely to be considerably increased in the near future and it is said that the developments at the bottom level continue to point to a greatly enhanced value in the ore reserves.

Interest in metalliferous mining at home has not been quite so keen, owing, perhaps, to the holiday season, but a 'gold rush' is reported in Ireland. It is rumored that much interest has been aroused in Roscommon by a discovery made in a quarry at Boho, near Castlerea, where some workmen, during quarrying operations, found between two layers of rock a lump of virgin gold about the size of a goose egg. The fact that the nugget is composed of the precious metal has been confirmed by a Dublin analyst. Copper mining is still attracting attention in the country; the Irish Copper Mines, Ltd., was

registered last week with a nominal capital of £60,000. Amongst the subscribers is the name of Lord Armstrong for 10,000 shares.

The visit paid to this country by the American Institute of Mining Engineers is regarded as an event of the highest industrial and scientific interest. The occasion has been made use of to compare the pigmy proportions of our iron and steel trade with those of its transatlantic competitor. It is, however, consoling to note that we "export far more iron and steel than any other country; twice as much as the United States, and nearly 50% more than Germany," and that while "with the United States large exports of iron and steel are generally a sign of adversity; with the United Kingdom they are a sign of prosperity."

BUTTE, Montana, August 18.

The properties secured from Heinze by the Red Metal Co. are being put in shape to make a big showing in the near future. Nearly all their work at present is in the line of development and exploration, the biggest strike, so far, having been that in the Minnie Healey on the 1,100-ft. level. In the meantime the sinking of the Corra shaft has been resumed under contract, and will be sunk several hundred feet. The stoppage of the work was partly due to trouble with contractors, sinking and raising being chiefly carried on by contract in this district.——A. C. Carson, superintendent of the Red Metal & North Butte Co., says that the system of intermediate drifts, which was extensively used in all the Heinze mines, is being discontinued and all chutes are being built to the sill-floors, instead of ending half-way down the stopes as formerly. The intermediate system afforded an expeditious way of getting out ore, but is not considered satisfactory in the long run. The Speculator mine is now hoisting ore in skips, but the loading-chutes on the three levels are not yet finished and the amount of ore hoisted is therefore limited. The chutes will be ready for use by the end of the month when the output of the mine will be nearly doubled by the improved facilities for hoisting. At present the mine is raising about 1,000 tons per day. The Nordberg compressor, built for 35,000 cu. ft. of air per min., was recently put in operation. The Corra is hoisting 200 tons daily; the Rarus from 600 to 700 tons; and the Minnie Healey from 500 to 600 tons per day.

The mines on the hill are all sinking their shafts since the strike on the 2,400-ft. level of the Anaconda last winter. The High Ore shaft has been sunk to the 2,400 to handle the water from the Anaconda and neighboring mines, which had become deeper than the High Ore. The Never Sweat shaft, through which considerable Anaconda ore is hoisted, is now the deepest in camp, having reached the 2,500-ft. level. The Never Sweat hoisting engine was recently re-adjusted on its foundation, owing to movement of the ground, and will probably be moved farther back from the foot-wall during the summer. Last month the mine was closed for two weeks owing to the settling of the engine. When the work of moving it to a permanent position is commenced, it will be necessary to close down the mine for perhaps two months. No development is going on in the mine at present, and the filling used is waste from the Bell and Diamond mines, which is moved at a cost of 30c. per ton. One shift is employed entirely in lowering this waste into the mine and tramming it to the stopes. There are 200 men working in the Never Sweat at present. It is thought that the importance of this shaft will be lessened when the company has the Belmont, or some shaft on the lower ground to the south, in condition to hoist Anaconda ore mined in the south vein, which is several thousand feet from the shafts of the Anaconda and Never Sweat.

The Pennsylvania mine of the Boston & Montana Co. has the foundations nearly ready for their new hoist. The round cables are now replacing the flat ropes in this, as in all the deep mines of the camp, flat ropes having been almost exclusively used here for many years. The flat cables necessitate the keeping of a rope-gang to repair them from time to time, and it is considered cheaper to buy round ones, use them for a year or two, and replace them with new. The Pennsylvania is hoisting about 900 tons per day.

The Butte & Boston Co. is opening up the old Berkeley shaft on the Never Despair claim, and has already taken out some good ore. The shaft is 800 ft. deep, having been abandoned several years ago. The mine will be developed, and it is thought will yield at least 300 tons per day. Mining was resumed this week in the old stopes.——The Davis-Daly mines are getting into shape for mining in the near future. Three new compressors and two hoists have been installed on the Mt. Moriah, Colorado, and Plymouth. The hoists have capacity to sink the shafts to the 1,000 level.——The Butte & Superior Copper Co., which was recently organized to work some of the northern claims bought from W. A. Clark, is purchasing several others in the same neighborhood. The Deadwood claim is under bond, the deal having been closed this week. Negotiations are still pending for the Damarat, Laura, and Enterprise. The purchase price of the Niagara and Raymond is about $360,000 for each, while that of the Jersey Blue and Four Johns together is $250,000.

B. F. Shearer and H. Bush, of Pittsburg, have secured control of the Bear Gulch properties near Yellowstone Park, which are said to contain rich veins of tungsten. The mines there have produced copper and silver for years, and it was only lately that tungsten was recognized. Both scheelite and wolframite are found. It is said that a shipment of 60 tons from the dump sold for $20,000 in Denver some time ago. The property is controlled by the Montana Tungsten Co. of Pittsburg and Gardiner, Mont. Within 90 days, according to Mr. Bush, mining will be in progress at the new camp.

It is stated on the authority of one of the chief engineers of the Amalgamated Copper Co. here, that in the report soon to be made by John D. Ryan to the directors of the Amalgamated Co. in New York, regarding the settlement of the disputed claims in the mines secured by the Red Metal Co. from Heinze, it has been determined that each company shall keep within the vertical planes of the lines of its claims; that is, neither shall take any extra-lateral rights. The adoption of this rule is made possible by the fact that the two companies own practically all the mineral lands adjoining the disputed portions. The mines affected will be the Minnie Healey and Rarus, of the Red Metal Co., and the Michael Davitt, being Butte and Boston property, and the other two belonging to the Boston & Montana Co. The Rarus is cut by two noted faults, and it was Heinze's contention that the veins apparently apexing in the Michael Davitt and Pennsylvania, were in part veins belonging to the Rarus directly north of those claims. He accordingly stoped much of his ore in ground lying under the surface of those two claims. In the Minnie Healey he contended that the veins dipped north under the West Colusa, and he was allowed to stope in both places by the courts. Although this settlement of the affair will take much of the ground formerly worked by Heinze, there will be some veins in both Red Metal mines which would otherwise belong to the adjoining claims, that they will now be at liberty to work.

A similar arrangement to avoid possible litigation between mining companies owning adjoining mines, was mutually adopted some time since in some of the large copper mining camps of south-eastern Arizona.

Mining Summary.

ALASKA.

The Bartells Tin Mining Co., of Tin City, Alaska, states that the first load of tin concentrate was shipped from the property on August 1, consigned to Seattle, where it will be sold to smelters. The Bartells Co. has spent a great deal of money in the development of its property. It is expected to send out from these mines several more cargoes this season.

A rich placer strike on the western side of Kenai peninsula, back 15 miles in the interior from Nenelchuck, has started a stampede to the diggings, which are on Deep creek, and Bat creek, a tributary. It is reported that 50c. per pan is common. Miners from various places along the Inlet and Turnagain Arm have flocked in to the number of 100 or more. The Inlet steamer Neptune was beached at Nenelchuck by the captain and crew while they went to Deep creek to stake ground. The original discovery was made by a Russian, John Kashevnikey, of Nenelchuck, who told Chris Hansen, an inlet miner, and the two went to the place together. Hansen and Kashevnikey staked claims and went to work. In a short time Hansen appeared at Seldovia with $200 in dust which he exchanged for an outfit and returned. In the meantime news of the discovery had reached the Inlet camps and the stampede was on. It is a region of low, rolling hills. Nenelchuck is a Russian settlement of 30 families a short distance up the Inlet from Anchor Point, where beach diggings have been worked for several years.

ARIZONA.

With the production of the first six months of the year on which to base calculations, the copper output of Arizona for this year promises to reach 300,000,000 lb. The monthly output of the various mines and districts is as follows: Bisbee, 12,500,000 lb.; United Verde, 8,000,000 lb.; Arizona Copper Co., 3,000,000 lb.; Globe district, exclusive of Mexican ores, 2,500,000 lb., Detroit Copper Co., 1,750,000 lb., Shannon, 1,250,000 lb.; Silver Bell, 500,000 lb.; Arizona Smelting Co., 400,000 lb. The June output of the Old Dominion Co. at Globe, was over 3,000,000 lb. The output of the Copper Queen for June was 8,000,000 lb. The new 200-ton smelter, at Helvetia, which will be blown in soon, will add materially to the total output for the territory.

COCHISE COUNTY.

A strike was made recently on John A. Duncan's Santa Fe claim near Paradise, in an open-cut, 20 ft. wide and 30 ft. long. Nearly one-third of the face of the cut is in pay ore mostly azurite and malachite.

COCONINO COUNTY.

W. W. Bass reports a strike near Bass' station on the Canyon railroad. In the past thousands of tons of ore have been shipped to the smelters at Pueblo and El Paso, but the establishment of the custom smelter at Humboldt will make it possible to ship ore to that point that heretofore was too low-grade to afford a profit by shipping.

GRAHAM COUNTY.

(Special Correspondence).—The headquarters of the Hot Springs Oil Co. has been moved to Safford, and last week at a meeting of the directors, it was decided to move the oil-drilling outfit from Hot Springs to Safford. Mr. Zierath and Mr. Morris have been in Safford three weeks securing land through lease and by location.——West, Clark and Rising last week closed a deal with parties at Globe for their property (14 claims) in the Stanley Butte district, for $30,000, to be paid in 50 days. This is the property on which a strike was made three months ago.——The Stanley Butte Copper Co. now has 25 men at work bettering the grade of the road from San Carlos to their mines, made necessary by the heavy hauling they will have to do in transporting the machinery. This company also has a force at work on a double-compartment shaft which they are sinking, and at which they will place a hoist.——The Morgan shaft of the Twin Buttes Mining Co. is down 270 ft. Three eight-hour shifts are worked with 30 men on each shift. The main shaft, 7 by 16 ft., is all in ore, and the width of the vein will not be known until it has been cross-cut.——The Arizona Copper Co. will replace the 10 h.p. electric hoist at the Clay mine by one of 50 h.p.——Mining interest among all property owners of this district has been given an impetus by the fact that the Southern Pacific Railroad Co. has given a contract to the Langtry-Sharpe Construction Co. for the completion of 300 miles of road in three years. The proposed line will have one terminal at Durango, Colorado, and the other at some point in Arizona on the Southern Pacific. The road will run through San Juan county, New Mexico, a coal district, cross the Sante Fe railroad at Gallup, in another coal district, pass down the valley of San Francisco river and through Clifton and Morenci. This road will open up an important fuel region and facilitate obtaining coal and coke for the smelters in this district.

Morenci, August 17.

YAVAPAI COUNTY.

The Golden Idol Mining Co., with properties on Cherry creek, northeast of Prescott, expects to have a mill in operation on the group of four claims this fall.

CALIFORNIA.

BUTTE COUNTY.

(Special Correspondence).—At Marysville it is reported that W. T. Ellis, Jr., is endeavoring to secure options on a number of agricultural tracts east of that city; it is thought, to combine the property under a single ownership, and then to explore the territory for mineral. The land is situated in the recognized copper belt passing through this part of the State.

Marysville, August 18.

CALAVERAS COUNTY.

Twenty men are employed at the Nassau copper mine on the Pool ranch. At the 100-ft. level a drift has been run 200 ft. and stopes opened. At the 200 level the vein has been uncovered for 50 ft., where it averages 15 ft. in width.

MODOC COUNTY.

(Special Correspondence).—Four men are working on the Kafader group driving a cross-cut to reach the vein on a porphyry-limestone contact. The shoot, where opened on the surface, shows specimen ore on the contact, and the porphyry prospects for a width of 10 ft. A company has been incorporated to develop the Maupin vein, which has been prospected to a depth of 30 ft., the ore assaying 8 oz. silver and 1 oz. gold per ton. Recent finds of high-grade ore have been made. The Sunset vein is being developed by an adit, the quartz, carrying silver and gold.——About 25 tons of free-milling ore have been taken out of the Sugar Pine claim, at the surface. The ore was only discovered during the past month. The vein is vertical between shaly andesite and massive porphyry, and is 2 ft. wide; it mills $35 per ton, and assays $40 to $50. Some specimen ore has been found at the intersection of a rhyolite dike with the vein.——The Wade-Plummer is to be developed by a new shaft Dr. Patterson has acquired four-tenths of the property, and the remaining interest is under bond to Stribling & Hornback. The best ore assays $40, but the surface pans well along the contact.——A strike of rich ore has been made of ribboned quartz and lime, on a contact supposed to be phonolite. It is situated at the Mineral Spring camp. A busy lot of prospectors are at work in the vicinity. A stampede was created at Fort Bidwell, and Lakeview, Or., August 8, by John Loftus sending in rich samples for test, the ore, quartz stained black by iron, assaying 10 oz. gold and 1 oz. silver. About 50 teams have already passed through Adell, on the road to the strike, which was made in Windy Hollow, eight miles northwest of Plush, Oregon. This district is similar to that about the Sage Hen mine, which has been prospected for 12 years. The ore assayed well but would not pan, and not until within the last month has free gold of consequence been found. The ore is reported to be 100 ft. wide. This outcrop is considered a continuation of the Warner range. The latest news from arrivals is that large dikes from this and the adjoining district show heavy pannings of gold. The ore is hematite in quartz and lime.

Fort Bidwell, August 18.

NEVADA COUNTY.

Prospects at the Jenny Lind gravel mine are bright. It is reported that since the mill has been changed to work

gravel, during the 14 days it has been in operation, 558 cars have been put through as a trial run, with better returns than had been expected. The Jenny Lind is believed by many to be the extension of the Alta lead, which produced very rich gravel.——The drain-adit at the Austin mine in Willow valley, near Nevada City, is nearly completed. It will tap the shaft at a depth of 250 ft. on the pitch of the vein, while the shaft is only down about 190 ft., so it will have to be sunk 60 ft. before the adit is reached. As soon as the adit is finished, sinking will be resumed.——A rich strike is reported on the 1,100-ft. level of the Empire mine, near Grass Valley. It is the oldest quartz mine in the district, having been worked practically without cessation since 1850.

SIERRA COUNTY.

(Special Correspondence).—It is reported that rich gravel has been struck in the Bellevue mine near Gibsonville.—— At the Happy Hollow mine 12 men are doing well in a drift mine. Charles D. Akers is superintendent.——The Herkimer mine has been constructing a ditch 4,000 ft. long to run the air-blast. As soon as completed three shifts will be put at work in the mine.——Peckwiths & Spaulding struck gravel worth $38 per ton in the West Point mine, near Downieville, last week.——The Telegraph mine is getting specimen rock in the bottom of the shaft, which is 50 ft. below the adit level.——C. J. York is building a five-stamp mill at his foundry at Downieville for his Mexican claim near town.——John Henderson is constructing a five-stamp mill for J. L. Buckingham on the Elsie mine in Jim Crow canyon.——The King Con. Mining Co., operating near Loganville, has purchased from J. W. Finney the 20-stamp mill at the Sierra mine and will remove it to its mine at Loganville, that has been developed recently. It is opened to a depth of 500 ft. by an adit. The vein is from four to five feet wide. A recent mill run proved satisfactory. John Hayes is superintendent.——The Marguerite Co. is running its 20-stamp mill and expects soon to have the water out of the shaft and resume sinking.——The Keystone mill is again running after a hang-up due to the breaking of a shaft.——The Sovereign has a cross-cut through a 20-ft. vein in two places that prospects well in free gold besides sulphides.——The Empire Co.'s mill in Gold valley is idle during repairs and the building of a cyanide plant. Men are doing development work in the mine.——The Los Angeles Co., that has a bond on the Columbo, has men repairing the adits and getting out timbers.——H. L. Johnson has made another rich strike at Alleghany, in the El Dorado claim, formerly owned by Fessler & Lewis. The Oriental Co., under the management of H. L. Johnson, has struck pay-ore in the lower adit.

Downieville, August 18.

TUOLUMNE COUNTY.

(Special Correspondence).—The Longfellow mine, at Big Oak Flat, is now being operated with power furnished by the Tuolumne Electric Co. The Mack mine, adjoining it, will be started up this week with electric power. Matt Jacobs, who will have charge of operations at the latter mine, arrived a few days ago. —— Machinery is being purchased for the mine of the Springfield Tunnel & Development Co., near Columbia. At a meeting of the directors last week, Nathaniel Clark was elected president. —— The mill on the Hunter mine, near the Buchanan, south of Tuolumne, has started on ore from the Paymaster, the property of the Standard Mining Co.——J. Ross Clarke, accompanied by R. A. McWilliams and his secretary, has been examining the Patterson mine near Tuttletown. —— The Yellow Jacket, Good Luck and Ophir mining claims, better known as the Driesam group at Arastraville, will be sold at commissioner's sale in Sonora on September 12 to satisfy a judgment against the Driesam Gold Mining & Milling Co. obtained by Jas. E. Conde, et al. The plaintiff in the case held a mortgage of approximately $10,000 on the property.

Tuolumne, August 20.

A rich strike is reported made at the mine on the ranch of Ida Kline, near Stent, by J. N. Lyon, J. McFarland, and Lew Baum, who have a bond on the property and who have been prospecting it for some time. Assays run into thousands of dollars per ton, and in some parts of the vein the gold is in coarse pieces and layers. The rock also contains sulphides which assay from $70 to $500 per ton. The discovery was made during the latter part of last week in a swampy spot that had not been disturbed by the pick of the prospector. As a result, the Calico mine, at which operations were recently stopped, has been started up again and will be worked with a full force. The strike is certain to create greater activity in that part of the Mother Lode.

Tuolumne, August 21.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The new strike in the Doric tunnel of the X-Ray Co. is the sensation of the week. A raise was started from the east drift in the Cram lode, cut by the tunnel at 2,400 ft. in from the portal and about 2,000 ft. vertically below surface. At 20 ft. up the ore opened out to a 4-ft. vein carrying over a foot of solid galena which runs 50% lead, the rest of the orebody being iron and copper pyrite with thin veins of polybasite running through it. Assays as high as 4 oz. gold and 600 oz. silver per ton, with 7% copper have been obtained from this ore. At 400 ft. farther ahead in the adit the Sequel lode, which has been followed for 200 ft. east-west, shows an 8-in. vein of ore nearly the entire length of the drift, which carries 1.5 oz. gold, and 400 oz. silver per ton and 17% copper. This mine is situated almost within the town limits.——The Main Gulch Co., operating the Smuggler mine which recently struck a body of high-grade silver-lead ore while sinking in the main shaft, has made arrangements with the Whiting Co., owners of the Terrible mill, to treat its ore. A cable tramway, 1,500 ft. in length, is being erected from the shaft-house to the mill in the valley below. The company has a 3-ft. vein of lead-zinc ore in the 90-ft. level from the shaft. It was to exploit this that the old Smuggler mine was re-opened three months ago.——The Two Sisters Mining & Power Co. has the building for its electric power-plant well under way. When the water in Clara creek is lower next month, the dam which was commenced last winter, will be completed. The plant is designed to give 500 to 600 h.p. the year round. Electric light and power-lines will be strung to the company's mine at Silver creek, where a large concentrating mill is in course of construction. The old dumps of the mine contain 75,000 tons of milling ore, stated to be worth $7 per ton. New orebodies are now being opened in the levels east and west from the Headlight shaft which is down 275 ft. In the 160-ft. level there is a continuous vein 18 in. in width for 200 ft. carrying $20 in zinc and lead and 25 oz. silver per ton.——The schedule on lead issued by the American Smelting & Refining Co. gives a raise of 14.5c. per unit. The Chamberlain Sampling works here are now paying 11c. per unit more for lead than heretofore, which brings their price for lead up to that which the Santiago mill and independent sampler have been paying.——Much attention is now being given that portion of Leavenworth mountain north of the Colorado Central mine. The Key West Co., operating the McKinney mine; J. Schuler on the Herkimer; Patterson & Co., on the Fort Dodge; Kendall & Sprousse on the Argentine and Creole, and the Georgetown Leasing Co. on the Brannigan, all have good showings of ore, and are getting shipments ready.

The Capital tunnel, now in 3,800 ft., will, it is thought, this week cut the Ætna lode, an extension of the Colorado Central vein, at 1,600 ft. from surface. The Butte silver lode, recently intersected by the adit, shows an 18-in. vein of lead and iron sulphide.——The annual report of the Transcontinental Transportation & Mining Co., shows it has $20,855 cash on hand, having expended up to date $46,108. This money was all subscribed in London. The company is driving a 12 by 16 ft. tunnel through the top of the range underneath Argentine Pass, the total length of which will be 7,000 ft. It is now in 1,400 ft. from this side and work has been started on the western slope. Two 80-h.p. boilers and a 150-h.p. air-compressor have been ordered, which will supply power for machine-drills on the western side. This tunnel will connect the Atlantic and Pacific slopes by the shortest possible route, and its conversion into a railroad tunnel is a foregone conclusion.

Georgetown, August 18.

FREMONT COUNTY.

A rich strike of silver ore is reported from the vicinity of Florence, two miles west of Spaulding. Many claims have been located by prospectors who rushed to the new field as soon as the strike became known.

LAKE COUNTY.

The first large shipment of ore ever made from the territory west of the Iron Hill fault, and south of California gulch, is credited to the New Emmet, formerly known as the Crescentia lease, operated under the management of A. F. Wuensch, one of the lessees. The orebody is in limestone and is 12 to 15 ft. wide of clean ore. The crevice is nearly vertical. The height of the shoot has not been determined beyond about 15 ft., though it is presumed it will continue up through the limestone to the porphyry contact, the distance to which is not known. The trend of the channel is northeast-southwest, and has been opened 100 ft. The mineral next to the limestone walls is largely ferromanganese, assaying 10 to 20 oz. silver per ton, with a little lead. The central portion of the shoot is a fine looking sand carbonate with a little galena, and assaying 5 oz. silver and upward. So far about 750 tons have been shipped to the smelter.

MINERAL COUNTY.

Creede district has shipped 40,320 tons of ore and concentrate to smelters during the first seven months of the current year. The concentrate represents reduction of four to five tons of ore into one. The Creede United Mines Co. is operating on the eight-hour schedule and has changed its pay-day to the first of each month. Henry Brandt is putting an air-pipe line into the cross-cut adit on the property of the Rio Grande Mining Co. at Spar to supply air to the miners working in the face.

TELLER COUNTY.

An unusual contention has developed in the District Court of this county in an application for an injunction against the Indicator Gold Mining Co. and lessees, restraining them from proceeding further in sinking a shaft on the Indicator fraction, on Beacon hill. The plaintiff in the case is M. B. Burke, owner of the Henry Adney, which is situated 200 ft. down the hill from the Indicator fraction. Burke sets forth, in his application for an injunction, that defendants are now engaged in sinking a shaft through a solid granite dike about 40 ft. in thickness, and that this dike backs up a water course and that if it is pierced the workings of the Henry Adney at a depth of 600 ft. will be inundated, and the lives of miners in the property who are working directly beneath the dike will be endangered by the flow.

IDAHO.

BLAINE COUNTY.

The Cracker Jack mine, in the Buffalo Hump district, is being investigated with a view to furnishing the mines with power. Operations in the Buffalo Hump district have been handicapped for the want of cheap power, and the Cracker Jack expects to build a dam and use its 100 ft. of additional head. As the result of operating two stamps during July the company netted $1,100, and in addition to this $170 was netted from three tons of concentrate treated in the chlorination plant of the Jumbo company.

BOISE COUNTY.

John Treweek, manager of the Sunnyside mines in Thunder mountain, will construct a cyanide plant, the initial capacity to be 100 tons daily. The enlargement of the plant will follow as rapidly as facilities will permit, the power ultimately to be electricity. A plant will be installed next summer.

IDAHO COUNTY.

(Special Correspondence).—What is said to be the richest gold strike made in Idaho in many years is reported in an abandoned tunnel near Florence, east of Spokane, where gold is found in decomposed ore, assays of 10-lb. samples running from $3,500 to $5,800 per ton. The ore is free-milling. According to Government reports, Florence was at one time one of the richest gold camps in the West. In its boom days there were 10,000 men in the district. George Hearst and Joaquin Miller were among those in the camp in those early days. A stampede to the place is in progress.

Spokane, Wash., August 18.

Charles Ellison, of Elk City, has made a good silver-lead strike on his property in the vicinity of Profile gap, in the Big Creek district. The ore was found 350 ft east of the Crown King adit. The ore resembles that of the Coeur d'Alene district. The camp is well watered and has plenty of timber available. About 10 or 12 miles of the wagon road remain uncompleted from the south fork of the Salmon to Government creek; the miners of Profile camp have turned out in a body to finish it and are working near the mouth of Elk creek. When this road is completed machinery will be installed in the Pan-Idaho property.

SHOSHONE COUNTY.

(Special Correspondence).—Work will be resumed in a few days on the Blue Grouse property in the Cœur d'Alene district and will be continued throughout the fall and winter.——The Tamarack & Chesapeake mine in the Tiger Peak district will increase the working force and prepare to ship ore.——F. Augustus Heinze is said to be negotiating for the purchase of the Rex mine in the Cœur d'Alene district. He and his associates own the Stewart mine, and it is said that with the acquisition of the Rex a smelter will be established.——Thomas Thwaite, of Spokane, has taken a bond on the Highland Chief claims near Wardner for $178,000, near the Stewart mine.——W. D. Greenough, manager of the Snowstorm mine at Mullan, when in Spokane today, said that a dividend of $90,000 will be paid September 10. The present company took charge of the property July 10.——The Snowslide Mining & Milling Co. at Mullan has been incorporated with a capital of $1,000,000. George Snow is president.

Wardner, August 18.

The Comet Mining & Milling Co. has voted to levy a four-mill assessment to raise funds to develop the group of five claims owned by the company on Pine creek, near Wardner. Some galena has been found in the mine.

MONTANA.

BEAVERHEAD COUNTY.

The Silver Fissure Mining Co. is working its mines, at Polaris. A traction engine was recently put on the road. The smelter is expected to be in working order early in the fall.——H. R. Melton says the Iron Mountain mine, at Argenta, has the adit in 700 ft., and 50 in. of water is running out of it now. Since striking water, one spring above has quit flowing and all the old prospect shafts in the vicinity are being drained of water. Jas. Phillips has appropriated the water flowing from the mine into the Rattlesnake creek. A cross-cut will be made to the Iron Mountain shaft which will supply air, when the compressor now in use may be dispensed with for a time. So far no orebodies have been encountered in the adit.——S. Roberts, foreman of the Monument Mining Co., in the Bloody Dick mining district, says that night and day shifts are worked in an adit now in 270 ft. At 500 ft. it is expected to reach a vein of gold and copper ore.

NEVADA.

NYE COUNTY.

(Special Correspondence).—There is already in the bank a sufficient sum for the erection of a large stamp-mill in Manhattan district. It will at first have 25 stamps, to be increased as the demand warrants. Engineers who are investigating the water question have instructions to go 50 miles from Manhattan, if necessary, to get a suitable supply. The mill is expected to be ready to handle custom ore by November. Several carloads of ore have been shipped to Salt Lake for experimental test. Milling ore is being piled awaiting the erection of this mill. Contracts for other mills have been let, and extensive mining will be done in Manhattan district this fall and winter.——New strikes continue to be reported almost daily.—— In the adit on the Georgey group of the Manhattan Nevada Gold Mines Co. at Central, a 12-ft. vein was encountered when in 75 ft., and recently a drift started on this vein, to find the pay-shoot, struck $35 ore when in 10 ft. This ore resembles that from the Manhattan Con. The adit is in 155 ft., and another vein has

been cut. Samples taken from the face of the adit assay $15 per ton gold. —— A small vein of high-grade quartz has been uncovered in the Muleskinner claim of the Manhattan Mother Lode Mining Co. by prospectors who were tracing a vein across that claim into their ground adjoining. The stringer was covered under a foot of wash, and had not been noticed by the management. Men will be put at work on this new find. —— Good ore has been encountered in the adit of the Consolidated Manhattan Mining Co. at East Manhattan, where a six-foot vein assays $42 per ton gold. A drift will be started on this vein. This is the twenty-third vein that has been cut in the Consolidated Manhattan adit, each of which contains gold, but the last vein is best, so far. —— The Manhattan Mammoth, adjoining the Consolidated Manhattan on the east, has also struck good ore in its adit, as has also the Manhattan Jumbo, in a shaft which is being sunk close to the town. —— Still further east, and a little south of East Manhattan, the Hindocraft property reported a strike last week, and development has opened up high-grade ore. —— The Manhattan Giant, adjoining the Manhattan Nevada Gold Mines Co. on the north, has an eight-foot vein of milling ore in its incline shaft.

Manhattan, August 18.

LINCOLN COUNTY.

(Special Correspondence). — The Pacific Coast Mines Bureau, of Los Angeles, recently purchased the Duplex Extension mine adjoining the Brockman mines, and J. D. Reaves, their representative, has outlined a plan of development.——Henry E. Carter, manager of the Searchlight Mining & Milling Co., states that his company will install a steam-plant. Two 70 h.p. boilers have been purchased to run the pumps. The water will be used as fast as pumped, in the mill and cyanide tanks. Mr. Carter is putting in a cyanide plant. —— H B. Adsit has purchased the Dora group of three claims from Charles Vanina, the group adjoining the property of the Colorado Mining & Milling Co., of which Mr. Adsit is president and manager. The double-compartment shaft is being carried to the 200-ft. level. Mr. Adsit also bought a half interest in the Red Bird group from W. J. Kennedy. These claims adjoin the Colorado Mining & Milling Co. on the south. —— The latest Denver concern in the field is the Samuel R. House Co. They have incorporated as the Searchlight Quintette Gold Mining Co., to develop five claims on Doherty mountain. The property is situated near the Boston group, the Southern Nevada and Santa Fe, and the Duplex properties. Present development comprises a 50-ft. shaft and a 50-ft. adit. On the Azusa, west of the Quintette, and apparently on the same vein, ore has been found which assays well in copper; copper has also been found in the Waterspout shaft to the south, and ore from a 10-ft. shaft on the Quintette assays $20 per ton copper.

The Pittsburgh-Searchlight Co. was organized during the past week to develop claims a mile east of town. —— The main shaft of the Leafstalk Gold & Copper Co. is down 70 ft. on a three-foot vein of gold-bearing ore, samples assaying $127 per ton. Copper and lead are also found.——The Adsit shaft on the Gray Ghost is down 50 ft. A hoist is being erected and two shifts employed. —— Vontrigger, in the Signal district, in San Bernardino county, Cal. is the scene of another strike. The California Gold & Copper Co. owns nine claims there. At the 200-ft. level a cross-cut passed through 18 ft. of sulphide ore carrying 20% copper, and the hanging wall has not been reached. Twenty-five men are employed. The mine is equipped with hoist and machine-drills. A smelter of 100 tons capacity is planned. —— The Searchlight Midas Co., a Denver corporation, has completed 50 ft. of a 200-ft. shaft. The property consists of three claims formerly known as the Blue Bird group, situated one mile east of town, near the Boston group. —— At El Dorado Canyon, the bonding of the Judge Parker group this week by H. J. Humphreys to Denver parties, represented by R. H. B. Warburton, is said to be a $50,000 transaction. The time limit is one year, during which a stated amount of development must be accomplished. The property adjoins the El Dorado mine. —— At a depth of 226 ft. in the Venus shaft a good-sized body of $30 ore has been encountered.

Searchlight, August 18.

(Special Correspondence).—A contract between the Searchlight Development Co. and the Santa Fe Mining Co., covering a term of years, provides that the latter shall supply the Development Co. with not less than 10,000 gal. of water per day, the present supply being over 65,000 gal. This abundant water-supply, added to that already developed, will provide the camp with ample fire protection. The Development Co. has contracted with the city to maintain an exclusive emergency storage tank to protect the camp against fire.——The Cyrus Noble Co. is cutting a station at the 500-ft. level. Drifts at the 300 and 400-ft. level have opened up new bodies of milling ore. The shaft is at an incline of 33 deg., so that the 500-ft. level represents a vertical depth of less than 300 ft. An additional 150 ft. is to be sunk. The new electric pump is discharging 50,000 gal. of water per day; the Duplex mine being furnished with 15,000 gal. for milling purposes. Joseph Luxon has resigned his position as superintendent of this company. His successor has not yet been named.——The Duplex Extension Mining Co. has let a contract for sinking a 100-ft. vertical shaft on the Regal claim, from which a cross-cut will be run to tap the vein traversing the John Brockman property adjoining.——The Annette Mining Co. has let a contract to sink the shaft from 55 ft. to 200 ft.——The Searchlight Mining & Milling Co. is employing more men than ever before. Twenty cyanide tanks are being put in place to treat the tailing, said to be worth $5 per ton. Cross-cuts at water level have proved the vein to be 14 ft. wide.—— Two undeveloped claims lying between the Searchlight and the Pompeii properties were sold this week by A. J. DeHaas for $16,000 cash. The X-Ray group, of six claims and a fraction, adjoining the Pompeii, has been bonded to the United Investors Co., of New York.——Charles Gracey has resigned the management of the Wharton mines in El Dorado canyon.——A cross-cut from the south-end drift from the 100-ft. level of the Cyrus Noble Extension has been run 24 ft. without reaching the foot-wall. As soon as the foot-wall is reached, sinking for the 200-ft level will begin.

Searchlight, August 18.

NEW MEXICO.

GRANT COUNTY.

The Comanche Mining & Milling Co. is putting tables and other machinery in place in the large new concentrator just below Silver City. It is expected to have it in operation in 60 days. By this time the company will have its smelter in running order and be enabled to handle all the ores that it will be possible for them to ship from the various mines in the surrounding section. The past few months large quantities of ore have been stored in bins at the smelter.

SOCORRO COUNTY.

At the Little Fanny mine in Mogollon district, 90 miles north of Silver City, a two-compartment shaft is being sunk. It is expected to sink it to 1,000 ft. The shaft is now down about 400 ft.——The Last Chance in the same district is producing $1,000 per day.

OREGON.

BAKER COUNTY.

(Special Correspondence).—E. A. Hutchins, who is interested in a property in Cornucopia camp, 40 miles northeast of Baker City, says the Cornucopia property has developed three ore-shoots, one 26 ft. wide, one 9 ft. and one 7 ft., all paying ore. The 20-stamp mill is running and 30 stamps are being added. Over 200 men are employed in the district, and the May Flower and Queen of the West are now on the list of producers. In the Copper Belt, between Cornucopia and Baker City, a surveying party is at the North American mine. Half way between this property and the Indiana mine, engineers are completing a railroad survey for a line known as the Oregon Central. Meantime, a road from Baker City to the copper belt is contingent on the raising of $100,000 by the people of Baker, most of which is reported subscribed. —— The North American shaft has reached a depth of 400 ft. in a deposit of sulphide ore. —— The Flagstaff mine, seven miles out from Baker City, in the direction of the copper belt, has resumed work. Mr. McLane is manager. This property was recently taken over by

Boston parties. The new organization is known as the Dorothy-Flagstaff Mining Co. A trust deed has been filed here to secure bonds to the amount of $350,000, issued by the International Trust Co., of Boston, to rehabilitate this property.——The Virtue mine, situated four miles east of the Flagstaff, which has recently been worked by W. L. Vinson, under lease, will now be operated by the Virtue Mines Development Co., which owns this property. It has contracted with the Eagle River Electric Co. for 500 h.p. —— The Gold Coin mine, near Durkee, recently lost its 10-stamp mill by fire. The work of replacing it is under way. The deposit is thought to be the bottom of an old lake bed set on edge and carrying, in gravel 75 ft. wide, about $8 per ton gold.

Baker City, August 18.

SOUTH DAKOTA.

PENNINGTON COUNTY.

(Special Correspondence).—Chas. Bishop, of California, who is reported to have purchased the Lookout property on Castle creek, five miles south of Rochford, is preparing to inaugurate work on a large scale. It is said that the mine and mill will be placed in good condition. The mill and tramways connecting with the several mine workings are fallen into decay and will require much repairing before any ore can be milled. There are excellent millsites on every side, but this mill was built on a flat, requiring a high, long and expensive trestle to reach it. There are several ore-bodies in the property, in the hills north of the mill, but some of the ore is not as free as could be desired. When this mine was worked formerly by the Lookout Co. in 1884–85, the operation was unsuccessful, due to various causes. It is thought that now, in the light of modern experience and metallurgical knowledge, success may be achieved.

Rochford, August 16.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—E. L. Tate, president of the Quilp Mining Co., is arranging to amalgamate the mines at Republic into one corporatian, which will build a mill of sufficient capacity to handle the entire output. It is said that New York and Montana capital is interested.

Republic, August 18.

KING COUNTY.

James A. Moore, of Kirkland, a suburb of Seattle, has purchased the right to mine bog-iron ore on the farm of Thomas Jefferson near Arlington, and gave $10,000 for the privilege. The analysis made was satisfactory, showing the iron ore to be of good quality.

OKANOGAN COUNTY.

(Special Correspondence).—M. A. Straight, of New York, is in Spokane, having inspected the Anonymous group on Belcher mountain. He announces that a compressor will be installed on the property, which will have capacity to supply the neighboring Golden Key and Oversight mines. ——An important find of copper is reported in Spokane from Loomis, where a 20-ft. vein, rich in copper and gold, was struck on the Copper World mine, owned by Jerome Drumheller of Spokane, and his associates. The ore was struck on the 200-ft. level. A winze is being sunk on the 300-ft. level.

Loomis, August 18.

SPOKANE COUNTY.

(Special Correspondence).—The Spokane Brokers' Association has been organized, with offices at 120 Post St.—— The National Gold & Copper Co. has been incorporated at Spokane.——Other Spokane companies recently incorporated are: The Snowy Peak Mining Co., the Acme Consolidated Silver-Lead Mining Co., and the Potosi Mining Co.

Spokane, August 20.

STEVENS COUNTY.

(Special Correspondence).—Assays of the ore recently found on the Butte & Washington Mining Co.'s property near Orient, north of Spokane, show gold, silver, and lead from $41 to $59. C. E. Brooks is interested in the property.——The Gold Bar Mining Co. announces that it will build a 40-stamp mill on its property near Sucker lake. Edward Staples is manager.

Spokane, August 20.

CANADA.

BRITISH COLUMBIA.

E. H. Thurston, owner of the Carmi, on the West Fork, left Greenwood Thursday with a new superintendent and crew of men to operate his property. Only five stamps will be dropped at first, but five more, now partly installed, will be added as soon as they can be got ready.——The output of the Rossland mines for the week ending August 18 was as follows: Centre Star, 2,580; Le Roi, 2,847; Le Roi Two, 467; total 5,894. Total for year, 200,893 tons. During the week ending Friday the 17 inst., the Trail smelter received the following shipments of ore in addition to those from Rossland: Snowshoe Boundary, 249 tons; Iron Mask, Kamploops, 93 tons; Snowstorm, Idaho, 78 tons; St. Eugene, Moyle, 58 tons; Ptarmigan East Kootenay, 23 tons; Paradise, East Kootenay, 23 tons.——Boundary shipments for this week were as follows: To Granby smelter, from Granby mines, 13,369 tons; from Emma 33 tons. To Dominion Copper smelter, from Brooklyn-Stemwinder, 2,903 tons, from Rawhide, 594 tons; from Sunset, 792 tons; from Mountain Rose, 75 tons. To Nelson smelter from Emma, 198 tons; to Trail smelter, from Snowshoe, 290 tons. Total shipments for week 18,254. Total shipments for year to date, 771,404 tons. Boundry smelter treatment for the week was as follows: Granby smelter, 15,250 tons. Dominion Copper Co. smelter, 4,364 tons. Total for week, 19,614 tons, total for year to date 769,968 tons.

The Tyee Copper Co., at Duncan's Station, Vancouver Island, reports smelter returns for July as follows: Smelter ran 11 days and treated 1,792 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $31,128.

MEXICO.

SONORA.

It is reported that the Greene Consolidated Co. of Cananea recently shipped 300 Chinamen from Guaymas to Cananea, where they are now working in the mines. They were brought over the railroad to a station below Nogales, and were taken across the country from that place to Cananea. It is said that the Greene Co. is short of miners, as many of the Mexicans heretofore employed there have left.

Trade Treatises.

THE ALLIS-CHALMERS CO., of Milwaukee, Wis., has issued bulletin No. 1,505 describing the Allis-Chalmers heavy-duty engines of the belted type.

PERCY PITMAN, of Rosbury, Ledbury, England, manufacturer of Hector water motors, multiple-nozzle impulse wheels, and combined turbine-dynamo charging sets, has issued catalogues and circulars descriptive of these types of machinery, and will send the same on request.

ATLAS ENGINE WORKS of Indianapolis, Ind., has issued a handsome Bulletin, No. 131, descriptive of throttling and automatic single-valve engines. It is clearly and handsomely illustrated. This company also makes a four-valve engine which it is claimed meets every requirement of power users.

THE ordinary gravel-roofing is formed by first covering the surface of the roof with dry felt (paper) and over this laying three, four or five layers of tarred or asphaltic felt, the layers of felt lapping over each other like shingles, so that only from 6 to 10 in. of each layer is exposed. Flashing against walls, chimneys, curbs of skylights, etc., is done by turning the felt up 4 in. against the wall. Over this is laid an 8-in. strip with half its width on the roof. The upper edge of the strip and of the several layers of felt are then fastened to the wall by nailing wooden strips or laths over the felt and into the wall.

Personal.

CHARLES BUTTERS is at Carlsbad.

W. H. SHOCKLEY has gone to the Yellowstone Park.

J. TROWBRIDGE BAILEY has returned to New York from Brazil

GEORGE W. MYERS has returned to Berkeley from Alaska.

E. W. SEBBEN, of Denver, is examining several mines in Arizona.

F. F. SHARPLESS has returned to New York from British Columbia.

H. A. GUESS is manager of the Silver Lake mines at Silverton, Colorado.

ALVIN B. CARPENTER, of Mexico City, is examining El Bote mine at Zacatecas.

W. H. SHOCKLEY, now residing at Tonopah, has been on a visit to San Francisco.

JAMES F. KEMP sailed from New York on August 23d, on his way to Mexico City.

S. F. EMMONS visited Denver on his way to the Geological Congress at Mexico City.

WILLIAM TENNER, of Los Angeles, has been inspecting mines in Sierra county, California.

VICTOR M. BRASCHI, of Mexico City, attended the American Institute meeting in England.

ARTHUR M. BREWSTER, manager of the Vivache mine in Oaxaca, Mexico is visiting New York.

DU RAY SMITH, of Oakland, Cal., owner of the Primrose mine in Sierra county, recently visited the mine.

SAMUEL JAMES has resigned as superintendent of Los Arcos Mining & Smelting Co. at Sultepec, Mexico.

W. A. ALLEN has been appointed superintendent of construction at the new San Bruno smelter, San Francisco.

GEORGE W. BORROWE has been appointed general manager of the Gt. Boulder Perseverance mine, at Kalgoorlie.

M. K. RODGERS was recently at Catella, Alaska, inspecting mining property, and looking over a proposed railroad route.

W. P. SAWYER, of Nevada City, Cal., principal owner of the Herkimer mine, in Sierra county, has been at the mine for a week.

W. A. CLARK, JR., accompanied by JOHN A. RYAN, has been in the Cœur d'Alene district several days looking over the Clark properties.

B. HUTHOFF, formerly manager for 12 years of Mohler Bartning Sucs., Mazatlan, has established a general commission business at 110 Battery street, San Francisco.

W. A. KUNKLE, superintendent of the Silver Lake mill, at Silverton, is making a trip through the different mining camps of Colorado and other States in order to investigate recent improvements in ore dressing.

WILLIAM A. POMEROY has recently been re-appointed general manager of the Palmarejo & Mexican Gold Fields, Ltd.; he has also been made consulting engineer to the Oxnam Prospecting Co. (No. 1), Ltd., at Chinipas, Chihuahua, Mexico.

HENRY STANLEY RENAUD, of Waller & Renaud, consulting chemists at 159 Front St., New York City, has recently been admitted to the Bar of the State of New York as an attorney and counselor-at-law. In connection with his work as consulting chemist, Mr. Renaud will devote his attention to chemical, techno-legal, chemico-legal, legomining and patent cases.

Obituary.

SAMUEL LEWIS PENFIELD, head of the Department of Mineralogy in the Sheffield Scientific School of Yale University, died at Woodstock, Conn., on August 14, aged fifty years. He was one of the highest authorities on the determination of minerals, and, as the author of several useful books on the subject. he was well known to mining men.

WILLIAM OXNAM died at Los Angeles on August 16. He was suffering from tuberculosis when he went to Los Angeles from Mexico in March. For two years he was superintendent of the mines of the Palmarejo & Mexican Goldfields, Ltd., at Chinipas, in Chihuahua, and later, manager of the Oxnam Prospecting Company.

A. MCCHARLES, a well-known mining man of Sudbury, Ontario, died at Montreal on the 5th inst. He was a native of Cape Breton, Nova Scotia, but came to Ontario in 1855 when quite young. He taught school and was engaged as a traveling salesman during the early part of his life, subsequently doing pioneer work in the West. He was latterly largely interested for many years in prospecting and mining operations in the Sudbury nickel region and took a very active part in the agitation for more liberal mining laws.

THOMAS S. AUSTIN, general superintendent of the Southern Department of the American Smelting & Refining Co., died of diabetes at El Paso, on August 22. Born at Stratford, Conn., about fifty years ago, and graduated from the Columbia School of Mines, T. S. Austin was one of the most successful smelter managers in the United States. The sudden end to a career of notable usefulness will be much regretted by his friends at Leadville, Salt Lake City, Socorro, and El Paso, at all of which places he successively held important positions as metallurgist. He leaves a wife and a young daughter; among the technical men he is survived by his elder brother, Professor L. S. Austin, and two nephews, J. F. Austin, superintendent of the Monterey smelter, Mexico, and Arthur Austin, who is at the Washoe plant, Anaconda.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, August 22.

Con. Virginia	$1.00	Jumbo	$1.55
Ophir	3.70	Manhattan Con	1.00
Savage	1.00	Jumping Jack	0.42
Tonopah Ex	6.25	Midway	2.25
Belmont	5.12	Mohawk	4.45
Jim Butler	1.57	Red Top	1.70

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 16. £ s. d.	August 23. £ s. d.
Camp Bird	1 5 0	1 4 6
El Oro	1 9 4½	1 12 6
Esperanza	3 5 0	3 13 1½
Dolores	2 0 0	1 18 3
Oroville Dredging	0 16 3	0 19 6
Stratton's Independence	0 3 9	0 4 3
Tomboy	1 4 9	1 5 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 16.	Average Prices for Week Ending August 23.
Copper—Lake (cents per lb)	18⅜ @18¾	18⅜ @18¾
" Electrolytic "	18 5/16 @18⅜	18 5/16 @18½
" Casting "	18 @18⅛	18 @18⅛
Lead "	5.75	5.75
Spelter "	6.025	6.025
Silver (cents per oz.)	66¼	66⅛

CURB QUOTATIONS—NEW YORK.

	Prices for August 16.	Prices for August 23.
Bingham Central	2	2¼
Boston Copper	26⅞	28¾
Calumet & Arizona	16½	16½
Cumberland Ely	7½	9
Dolores	9½	9
El Rayo	4⅞	5
Guanajuato Con	5⅜	5½
Giroux Con	7⅜	7⅜
Greene Con	24⅞	25⅛
Nevada Con	18⅛	18⅜
Nipissing	6	6⅝
Tennessee Copper	45⅛	45
Tonopah Ex	5⅜	5⅞
Tonopah-Belmont	4.90	5⅛
Tonopah	18¼	18¼
United Copper	63¾	64¾
Utah Copper	27	29⅜

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

A 10-STAMP MILL on the Kalgoorlie field of Western Australia, has gravity stamps weighing 1,750 lb. each.

CASSITERITE occurs as a replacement of topaz in the granitic rock of Mount Bischoff in Tasmania.

COVELLITE is not a common ore. It rarely occurs crystallized, being usually massive and of dark indigo blue color.

A TRIANGLE having two sides of 7 each and one side of 9.9 has approximately one angle of 90 deg. and two 45 deg. each. This is near enough for all practical purposes.

THE difficulty which men have of conceiving the aggregate effects of causes which have operated throughout millions of years, far exceeds all sources of prejudice in geology, and is yet the most unphilosophical of all.

MOLYBDENUM and titanium produce fast shades on leather. Molybdenum tannate has a great affinity for animal fiber. It is a deep yellow color, but a large variety of shades can be obtained by employing it in connection with logwood extracts.

WE would suggest that our Ketchikan, Alaska, correspondent communicate with Mr. Thos. A. Edison himself, or with Stanley Jordon & Co., 100 William St., or Louis Straus & Co., 60 New St., both in New York, who are buyers of cobalt and nickel ore.

THE crushing strength of granite is variously stated to be 12,000 to 20,000 lb. per sq. in., the tests being made on two-inch cubes. Solid granite not altered by weathering or other influences, weighs 165 to 170 lb. per cu. ft. according to the amount of iron-bearing mineral present.

IF greater hoisting capacity is required, it is better to increase the size of the skip or car than the speed of the hoisting engine. If the engine cannot hoist a somewhat larger load, it is also incapable of faster running, and the limit of its economical operation has probably been passed.

LITMUS is a peculiar coloring matter obtained from certain lichens, which are subjected to maceration with lime, soda, or potash and other chemicals. Upon fermentation the mass becomes blue. Paper tinted blue with litmus turns red when coming in contact with an acid, and blue litmus paper is consequently used as a test for the presence of an acid.

IN the gold mines of the Rand a new discovery, or new development of an old discovery, is being watched with interest. It is a lode of quartzite impregnated with auriferous pyrite, and lying in the foot-wall country of the Main Reef. This lode has been found by cross-cutting in a number of mines and is being sought in others. In one of the mines this lode is said to be eight feet wide assaying over $10 per ton. In some others it is too low-grade to pay.

A NEW diamond mine is being worked near Kimberley, South Africa, by the United South Africa Association and others. The property is known as the Paardeberg East Mines, and results are said to be satisfactory. The quality of the stones is reported as exceptionally good. Operations have been carried on in the past on a fissure vein. It is stated that the main deposit has been found in another part of the property where work is now proceeding.

AN instance of the cost of hydraulic mining in California is cited by W. E. Thorne in Trans. A. I. M. E., 1902. This was in El Dorado county, California, and the cost was $0.183 per cu. yd. The conditions were exceptional as the deposit was in a narrow canyon, and only 7 to 23 ft. deep, consisting principally of tailing from seam diggings that had been hydraulicked. The mine discharged into a tributary of the Sacramento river, and thus came under the rules of the Debris Commission. The cost of restraining dams alone was 3c. per cu. yd. of gravel.

IN laying out foundations and other superficial work without instruments, workmen sometimes make use of the fact that the sides of a right-angled triangle have a positive relation to each other. Thus, for instance—having laid out one straight line, a second line may be established at an absolute right angle to it by measuring off on the first line accurately eight feet, then measuring carefully in a diagonal direction to the second line a distance of 10 ft. When this second measurement touches the second line at exactly six feet from the corner, the two lines form an exact right angle.

WHEN arsenical ore (mispickel) is being treated in the stamp-mill by amalgamation, the greatest care must be exercised or the gold will be saved with difficulty. Inside plates should be used, and the quicksilver feed watched. Too much quicksilver softens the accumulated amalgam, causing any that may have accumulated on the plates to scale off allowing it to pass out of the mortar through the screen, when it may be lost, or at any rate give additional trouble in its recovery. If too little quicksilver be fed, the plates become spotted and require much otherwise unnecessary dressing. For ore of this character the copper should be plated with not less than four ounces silver per square foot of surface.

INSIDE amalgamation in mortars, or mills of any type, is always advisable where possible. The object of amalgamation is to recover gold from ore, and the sooner this can be accomplished after the ore has been crushed the better. If feeding excess of quicksilver causes the lower end of the outside plates to drip, feed less in the battery and give particular attention to the upper outside plate, endeavoring to catch any amalgam there that may escape through the battery screens. The probability is—in the Siskiyou county, Cal., instance—that the outside plates are not wide enough. With broad plates, properly dressed, the lower portion should not drip. Dress the plates from the lower end toward the mortar, and avoid feeding excess of quicksilver at any time.

IN providing a pumping plant for a mine, we must first fix upon the vertical height or lift of the pumping apparatus, and the quantity of water to be raised daily, as determined by proper measurements. There must be ample reserve capacity for emergencies; this point must be most carefully considered, as upon it may depend the security of the mine against flooding. Next we must consider the commercial efficiency of the installation, having regard to first cost as well as to economy of working. One would naturally put in a cheaper and more wasteful pump if the plant is to be in use for a shorter time. Where a large quantity of water is to be raised it is often well to put in pumps in duplicate, one of which will handle the water under normal conditions, so that, in case of flooding, both can be run. The life of such a plant is greater than in a single-pump plant which has to be continuously operated.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Gold and Pyrite.

The Editor:

Sir—I have read with much interest the valuable article by Professor Henry Lloyd Smith on the relations between gold and pyrite, which appeared in your number of July 14. An illustration is given of the manner in which the gold is concentrated in the pyrite in quartz veins, while the pyrite in the adjoining country rock is poor. Certain experiments described also seemed to prove that a secondary enrichment of gold had taken place.

That pyrite in quartz veins is, as a rule, richer in gold than pyrite in the immediately adjoining country rock is a generalization now universally accepted by students of mineral deposits. Becker probably was one of the first to recognize it, but statements confirming this law may be found in any of the more recent reports dealing with gold-quartz veins. The distinction drawn by Professor Smyth between the pyrite in the quartz and that in the country rock should perhaps be slightly modified. It is true that the latter is often formed by replacement of some iron-bearing mineral, but this is by no means necessarily the case, as shown by an abundance of pyrite sometimes replacing wall-rock very poor in iron.

The generalization referred to would read as follows: A vein-forming solution containing silica and gold will deposit the bulk of its silica and gold in open spaces, *if these are available*, and very little of either constituent will, as a rule, permeate and replace the adjoining wall-rock. The reason for this is, no doubt, that the silica is in colloid solution which is closely held by the semi-permeable wall-rock, which, on the other hand, is easily penetrated by solutions of ordinary salts, in accordance with well-known laws of physical chemistry. This also explains the rare occurrence of silicification of wall-rocks adjoining quartz veins. In some way the gold and, to a less degree, the other heavy metals, are held with the silica, perhaps also in part in colloid solutions; it is not denied that solutions of heavy metals may freely penetrate many porous rocks, but it seems certain that they will not do so if fissures are available, and if there is no strong chemical affinity between the rock and the solution. The poor pyrite in the wall-rock and the rich mineral in the vein were deposited practically at the same time and by the same water.

Secondary deposition of gold in veins is a mooted subject; it must certainly be confessed that compared to that of easily soluble metals, such as copper and silver, the secondary deposition of gold is a very rarely occurring phenomenon and involves very slow reactions. I admit having some doubt about its occurrence except in a few unusual cases; the evidence which Professor Smyth brings in favor of his case seems far from being convincing.

WALDEMAR LINDGREN.

Denver, August 9, 1906.

Misuse of Cement.

The Editor:

Sir—Some time ago the foundation for a heavy stamp-battery was constructed of concrete made by mixing very dirty sand with too small a proportion of cement. The concrete was placed spasmodically, several days sometimes intervening between layers. The stamps are now dropping and the cement layers are separating, with the result that cement foundations are considered unworthy at that plant. The concrete can be whittled with a pocket-knife and is hardly better than lime mortar. The size of the mortar-block was much reduced from the print supplied by the designing engineer, but very shortly the opponents of cement mortar-blocks will point with pride to this installation and say: "I told you so!"

MARK R. LAMB.

Goldfield, Nev., August 11, 1906.

The Treatment of Desert Ores.

The Editor:

Sir—I have been interested in the discussion by Mr. Bosqui and Mr. Hunt relative to the treatment of desert ores. As I have recently been required to devise a method of treatment for the ore of one of the mines near the Combination, at Goldfield, the following may be of interest.

The material is typical of the Goldfield district, but was the lower grade 'milling ore,' averaging about $20 per ton. When the samples were brought to the laboratory I was requested to make 'amalgamation, concentration and cyanide test' to determine the best possible extraction obtainable. The test gave the following results: Recovered by amalgamation, 32%; by concentration, 16.5%; and by cyanidation of tailing, 46.5%, making a total recovery of 95%.

The concentrate was very high grade—being over $500 per ton—and represented ½% by weight of the ore taken. After completing this test, I decided to try direct cyaniding of the ore after dry-crushing the whole of it to 100 mesh, with the result that I obtained 94% extraction. After confirming these results by further tests, I recommended the following general method of treatment: Dry-crushing to 12 or 16 mesh, fine grinding in tube-mills with cyanide solution to 100 mesh, agitation and filter-pressing.

The direct treatment of this ore by cyanide would have many advantages over the usual custom of amalgamation and concentration followed by cyaniding. In the first place water is very scarce; in the ordinary stamp-mill practice water is used in the ratio of from four to seven parts by weight to one of ore. In following the idea suggested above, it would be necessary only to use a sufficient amount of water as cyanide solution to get the best results from the tube-mill, and agitation tanks, and for washing in the filter-presses. According to Mr. Butters, El Oro practice shows that the proportion of water to ore used in tube-mills should be one to one, or less, to obtain the greatest efficiency. The plant would cost much less to install than the usual stamps and concentrators with sand and slime cyanide-annex; and, requiring but one crew of men, it would reduce the operating costs materially. I doubt the advisability of treating the majority of ores in both sand and slime plants; such plants in my opinion being suitable only to tailing piles where the crushing has already been done. In most ores if a plant is necessary to treat the slime when crushing coarse, it will pay to slime everything and treat altogether—thus combining all the work in one plant with one crew. Nor do I believe in the other practice—except in rare cases—of crushing all the ore to a 200-mesh slime. Those who have had to operate filter-presses or filtering devices realize the difficulty of filtering, washing and removing cakes of 200-mesh slime; while if all the ore is crushed to 100 mesh, agitated as one product and filter-pressed, the extraction is not materially reduced, save in exceptional cases, and the cakes can be made thicker and dryer, and are easily washed and removed. In fact, some of the new presses are so constructed that material of this kind can be filtered, washed and sluiced out automatically without entailing the expense of opening the presses between each change. This is not possible with a very fine slime, which becomes as tenacious as India rubber and must be almost chiseled from the cloths. In

the majority of cases the mill clean-up will show a greater extraction than if all is crushed to pass 200-mesh; the possible exceptions are sulphides or perhaps a clean silicious ore, free from argillaceous material.

Mr. Bosqui, in advocating wet crushing and amalgamation, mentions the "great advantage of being able to secure daily from plates 50% of the extraction obtained from $50 ore, as compared with waiting for the tedious monthly or bi-monthly clean-up in a cyanide plant." I confess that I cannot see this advantage. Crushing 60 to 75 tons per day and recovering $25 per ton would be but $1,875 per day at most, and surely he would not make a melt every day for that amount. A bi-monthly clean-up would amount to but $28,000, which is not an unusual clean-up even in our California mills. A cyanide plant, if properly designed, can be roughly cleaned up every ten days without any great inconvenience; to be followed by a complete clean-up, say once a month. I must agree with Mr. Hunt regarding the practicability of crushing dry to any required fineness, as instanced in cement mills, but that is not necessary. It is my belief that the time will soon come when nearly "every new modern mill operating upon a logical basis" on the deserts will be so constructed that crushing to 10 or 16 mesh will be done dry by breakers and rolls or ball-mills, and the whole product will then be mixed with cyanide solution of a strength sufficient to obtain the highest extraction and passed through tube-mills or some other device to reduce to a fineness of 100 mesh; that the product will all be agitated together and passed to filter-presses so constructed as to permit of automatic discharging.

The objection to dust, I think, will be overcome as it is in the cement mills of Europe, where the laws compell the installation of exhaust-fans and dust-collectors. In a plant such as I have roughly outlined, the dust could be conveyed by pipes connected with an exhaust-fan to a hopper, where a spray of cyanide solution would collect and carry it to be mixed with the tube-mill product. Such an arrangement would be efficient, and the cost of installing and operating would be trifling.

Another point which I think is generally overlooked is that the coarse gold in any ore when subjected to the grinding action of the tube-mill or any other machine necessary to pass it through a 100-mesh screen, will cease to be coarse gold. All of us know how brittle gold becomes even upon rolling, as is seen in assaying bullion when rolling out the cornets, which, unless repeatedly annealed, will break to pieces. This same action occurs in grinding the ore and is aided by the sand grit, so that by the time the ore passes 100 mesh, practically every particle of gold is a very fine scale, a most ideal condition for cyanide attack.

Crushing to 10 or 16 mesh, no matter how hard the rock, is done cheaper in breaker and rolls dry, than with breakers and stamp-mills wet. The cost of installation per given capacity is less, and in desert regions, where water is of itself such a problem, the dry-crushing method must appeal to both the manager and the metallurgist.

I think it is becoming generally recognized that fine grinding of the whole product to 100 mesh increases the profits, and when this is so I do not think amalgamation should play any part in the process, except possibly in very rich (over $100) coarse gold ores. The stamp-mill as an amalgamator and when crushing to 30 or 40 mesh has long held its place in the first rank, and for that purpose can hardly be replaced. But its success in this line seems "by the compelling force of custom" to lead metallurgists to its adoption in all cases. But new conditions have been presented. We no longer want a 30 or 40-mesh product, but a 100-mesh. Therefore, let us adopt the machines best suited to these new conditions.

Oakland, August 1. LOCHIEL M. KING.

Induction-Motor Hoists.

The Editor:

Sir—I read with much interest Mr. C. F. Lehman's article on an 'Induction-Motor Hoist,' and I desire to acquaint the readers of your paper with another method of gaining smooth acceleration for heavy hoisting duty in connection with induction-motors. The motor is connected directly to a Cutler-Hammer magnetic accelerator clutch; this clutch is adapted to be placed on the motor-shaft where the usual pinions are used, or attached. The best arrangement is to have the accelerators attached to the motor and the pinion with accelerator-disk on a separate mandrel in line with the rotor-shaft of the motor. This necessitates setting the motor a little further to one side than is usual. This clutch is energized through two small collector-rings on the induction-motor shaft through a small direct-current generator attached to the end of the induction-motor shaft. The motor used can be of constant speed type, and is kept constantly floating in the mains. In series with these accelerators a speeder is used, which is nothing more than a common field rheostat; by gradually increasing the magnetic flux in the accelerator, the load is gradually picked up without any disturbance in the voltage on the lines. This is a very important factor when investment in copper and generating capacities are limited. The direct current consumed is 10 watts per horsepower transmitted by the clutch. The above method is efficient and the operator cannot become confused, as he only has his brakes and speeder to manipulate. These accelerators are also being used to a large extent in driving. Air-compressors are used in conjunction with a pressure-governor. Whenever the pressure exceeds a predetermined amount, the governor inserts resistance into the speeder, which reduces the magnetism in the accelerator and allows the speed of the compressor to fall off, likewise it increases the speed of the compressor to maximum, as the pressure is reduced. By the above arrangement you are never blowing off, and it will readily be seen that by the use of these accelerators constant-speed polyphase induction-motors can be used to advantage and still retain all the desirable features of a variable-speed drive.

FRED P. DE WILDE.

Spreckels, California, August 5, 1906.

CRYSTALLIZED DOMEYKITE.—The natural mineral, a copper arsenide, containing 70% Cu and 30% As, upon exposure to the air changes from its normal yellow color to purple and blue on the faces of its brittle crystals. Dr. Koenig, in *Proceedings* American Philosophical Society, June 1, 1903, describes his method for the production of these crystals by the action of the vapors of arsenic upon a stout copper wire. On account of the growth of these crystals upon the copper wire he has named his apparatus an incubator. It consists of a closed tube 0.75 in. diam. containing 5 to 10 grams of arsenic, then a loose asbestos plug, and finally a wire 0.25 in. diam. and 2.5 in. long. The exterior of the tube was wound with platinum wire, which formed an electric resistance, and by which the wound portion of the tubes could be maintained at a high and steady heat. At this temperature the arsenic was sublimed, and the vapor thus formed, came in contact with the copper wire, which largely took up the arsenic, thus forming the artificial copper arsenide crystals.

PROF. CHAS. L. NORTON, of the Massachusetts Institute of Technology, gives the heat units, of various kinds of fuel, obtainable for one cent, as follows: "Coal, $12 per ton, 23,000; wood $10 per cord, 27,000; oil, 12 cents per gallon, 12,000; coke $10 per ton, 24,000; gas, $1 per 1,000 cubic feet, 6,500."

Gold Dredging in the Urals.

By WILLIAM H. SHOCKLEY.

*The Lozva river is a clear-water stream flowing from an altitude of 4,000 ft. and through a densely wooded country; it is navigable for good-sized steamers as far as Ivdell. Temperature ranges from -60 deg. F. in winter (early November to late April) to 90 deg. F. in summer. Rainfall is 20 inches. Communication is over the new railway from St. Petersburg through Viatka and Perm to Goroblagodatskaia, thence by branch-railway to Bogoslovsk, and by post-horses to Ivdell; north of this, travel is by boat in summer and reindeer-sledge in winter.

Ten dredges are at work and eight more are under construction. These were all to have been at work by the present summer, but political trouble has prevented. The Sans Galli Co.'s dredge (Bucyrus) is working in a swift stream near Nijni Tura. It digs 1,200 yd. per day and should in a season take out 60,000 rubles† or $30,000 at a cost of $15,000. Bedrock is hard slate, and boulders up to 300 lb. occur. Two iron pans 15 ft. diam. with revolving arms disintegrate the clay. The buckets fill one pan and outlet of other is closed to allow cleaning of material. A gate shutting off the pan-feed and an iron chute directing the material to the tailing-belt were used, but the water washed the dirt back on the belt. This was overcome by using the pans.

Two dredges of the New Zealand type on the Lobva river cost $45,000 and $25,000, respectively. The pontoon of the first is iron, and of the second, wood. Working expenses for two months for one of these was $2,065.80.

This dredge was built in the winter of 1904–5 in a pit on the river-bank. During the construction, chips, shavings, hay, and manure from the teams employed in hauling the dirt, covered the ice in the pit, and, by protecting it from the sun's rays, retarded the spring thawing a full month. During this delay, the river fell 10 ft. lower than the dredge. Instead of digging a diagonal canal to the river the pit was deepened vertically and the tailing was removed by teams. Another month was occupied in this work, giving a total loss of two months, due to bad management.

At Bogoslovsk, 1,663 prospecting shafts, of an average depth of 12.25 ft., cost $8.50 each, equivalent to $0.70 per ft. In Alaska, similar shafts cost from $3.50 to $8 per foot.

Neither of the two dredges on the Lobva river yielded any profit during 1905, although the gravel carried 16c. per cu. yd. In 1904, the Bogoslovsk estate began work with a Neviansk dredge of the New Zealand type on the bed and banks of a small sluggish stream, having a total width of 200 ft. The gravel is soft for a depth of 14 ft., with 5-ft. pay-dirt. This company is building two similar dredges of the New Zealand type, somewhat improved by a study of illustrated catalogues and of the Bucyrus dredges working in the region. A Neviansk dredge on the Sosva river, 60 miles north of Bogoslovsk, stuck on a rock at the beginning of the season, and in three months produced only 1.5 lb. gold.

The most successful work is being done at Ivdell, where a Bucyrus dredge built by the Putiloff works under the supervision of H. L. Lawson, an American dredge-master, was operated almost without a stop during its first season in 1905. Fig. 1 is a photograph of this dredge, which shows the steep banks of the river in the background. It has dredged nearly a mile of the Ivdell river, a swift stream 200 ft. wide, flowing through a limestone formation. The amount excavated daily is estimated at 1,500 cu. yd. The cost of the dredge, complete, including a Keystone drill and some prospecting work, was $70,000; and the profit for 1905 is estimated at $32,500. A duplicate dredge, estimated to cost $50,000, is under construction. On all these dredges, tables are used to save the gold; the Ivdell dredge has shaking screens; the others, revolving trommels.

COST OF OPERATING THE DREDGE AT IVDELL.

		Per month.	Total.
3 pilots	@	$37.50	$112.50
3 machinists	@	37.50	112.50
3 firemen	@	15.00	45.00
3 oilers	@	20.00	60.00
2 woodmen	@	17.50	35.00
2 clean-up-men	@	12.50	25.00
1 blacksmith	@	20.00	20.00
1 goldwasher	@	15.00	15.00
1 dredge-master (American)	@	180.00	180.00
Wood	@	150.00	150.00
Total			$755.00

The maximum expense per month, including repairs and all materials used, is thus estimated at $1,500.

The following conditions should be assured:

1. The work should be under charge of an American or New Zealand dredge-master, who has had experience in cold countries. This is a vital point. The Russian engineers, though well educated and intelligent, are poor managers.

2. Extensive prospecting is needed and can best be done in winter, by sinking shafts on the Siberian system, that is, allowing the water to freeze, sinking a short distance, waiting for the water to freeze again, and eventually reaching the bed of the river, even through running water. This method sometimes fails in the Urals, owing to unfavorable weather, or the presence of warm springs. Hand-dredges, worked by parties of six men or of three men and a woman (see Fig. 2), and washing a few yards daily are useful for prospecting river beds. A Keystone drill should be used on the river banks by every dredging company. In most of the Ural rivers the richest gravel seems to be in the bottom, the banks being poor.

3. A small dredge, run by steam or horsepower and costing complete not more than $5,000, would do good work on these rivers.

4. Dredges should be built on the bank and launched, in order to avoid the expense of a pit; wooden pontoons should be used.

5. If prospecting work shows that there is much clay in the gravel, the enterprise had best be abandoned, because no method of dredging has yet been devised that will handle successfully material of this character.

6. The gold, which is uniformly coarse, should be saved in iron-lined, wooden sluices, and not on tables. These sluices should be 120 ft. long, like those used in Montana. Nuggets which pass over ordinary tables can be saved in sluices. Repairs to sluices are trifling compared with the expense of keeping up the belts of tables. Moreover, in a cold climate, a sluice can be operated for a number of days longer than a belt or a bucket-elevator. The water flowing in a large stream does not freeze so readily; and hence it is not necessary to shut down when the first cold snap comes.

7. Grizzlies should be provided to remove the large stones, which should first be washed.

8. Two boilers are needed, steam being kept in one while the other is being cleaned. In this way less time is lost; and the extra boiler is also useful for other purposes. All driving shafts should be bored longitudinally, so as to allow an obstinate wheel or gear to be loosened for removal by heating, the shaft being kept cool by a stream of water flowing through it.

9. For swift rivers, buckets three cubic feet capacity are large enough. These should be closely set, and should excavate from 1,500 to 2,000 cu. yd. daily. For a dredge

*Abstract from July issue of Bi-Monthly Bulletin, Trans. A. I. M. E.

†One ruble is worth 50c. United States. We have converted the Russian currency into American money throughout this abstract.—Editor.

of this capacity, the following engines are advised: 60-h.p. for digging; 60-h.p. for 14-in. pump; 15-h.p. for swinging; 15-h.p. for trommel; 15-h.p. for elevating tailing (not needed if sluice is used); and 20-h.p. for electric light.

10. For swift streams, spuds are preferable to headlines for holding the dredge in place. The top tumbler-shaft should be adjusted to move without difficulty.

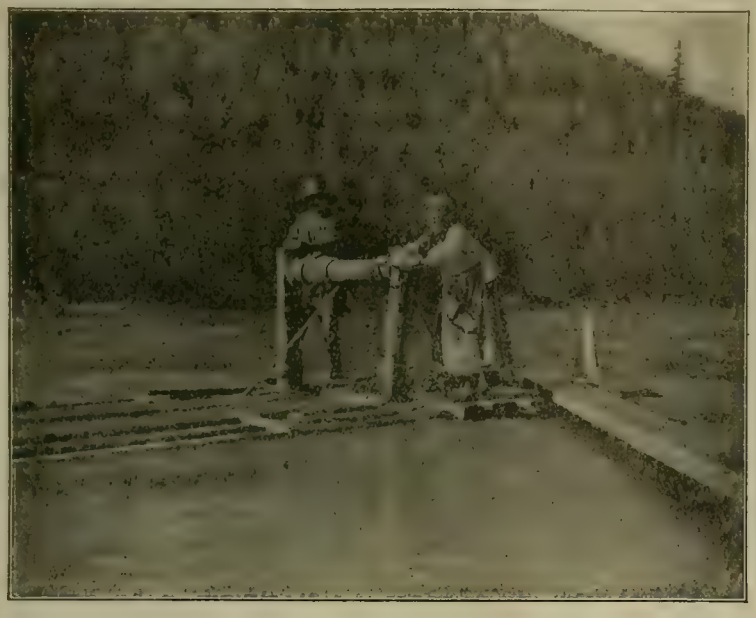


Fig. 2.

The mineral resources of the Urals are very great, and there is an immense field for dredging in the Russian Empire. When the present political troubles have passed away, the industry will exhibit a rapid development. The Russian laborer is good, considering his wage; and the officials, although sometimes troublesome, yield to tact and other influences.

An ingenious method of separating the heavier metalliferous minerals from gangue is thus described in a recent patent: "The pulverized ore is thoroughly mixed with soap solution and the mixture treated with a mineral acid, when the fatty acids thus precipitated carry down the heavier metalliferous constituents, while the gangue is washed away. The residue is then treated with caustic alkali, when the soap solution is regenerated and the heavy minerals obtained. The soap solution may be replaced by alkaline solutions of crude carbolic or cresylic acid, or even by a solution of tar soap."

Darwin said that geology was "an excellent science to begin with, as it requires nothing but a little reading, thinking and hammering." That is all any science or industry needs—and it is a great deal!



Fig. 1.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rocks from Chilpancingo, Mex., are: No. 1, a much-altered intrusive rock, apparently Aplite; No. 2, typical quartz-porphyry; No. 3, a very silicious phase of Aplite (Alaskite); No. 4, an intimate mixture of lead and zinc sulphide, which probably contains gold and silver. A little pyrite can be distinguished, and arsenic and probably antimony are also present. It is one of those complex sulphide ores for which Mexico is noted. No. 5 is Rhyolite; No. 6 is silicious Diorite, containing pyrite and chalcopyrite.

The rocks from Beatty, Nevada, may be described as follows: The unaltered piece is typical Rhyolite in which appear quartz blebs and crystals of sanidine (glassy feldspar), and a few black hornblende crystals are also seen. The flow structure is readily seen when magnified a few diameters. The soft piece is composed of fragments of the same kind of rock as the first, due to crushing of the rock mass, and may be from either a zone of fissuring and movement, or from a portion of the mass which has been crushed locally. It is Rhyolite-breccia. The crushing of the rhyolite has resulted in a greater or less alteration of the feldspathic mass to Kaolin, the larger fragments being little, or not at all altered. The presence of iron oxide suggests the occurrence of secondary pyrite and therefore of gold.

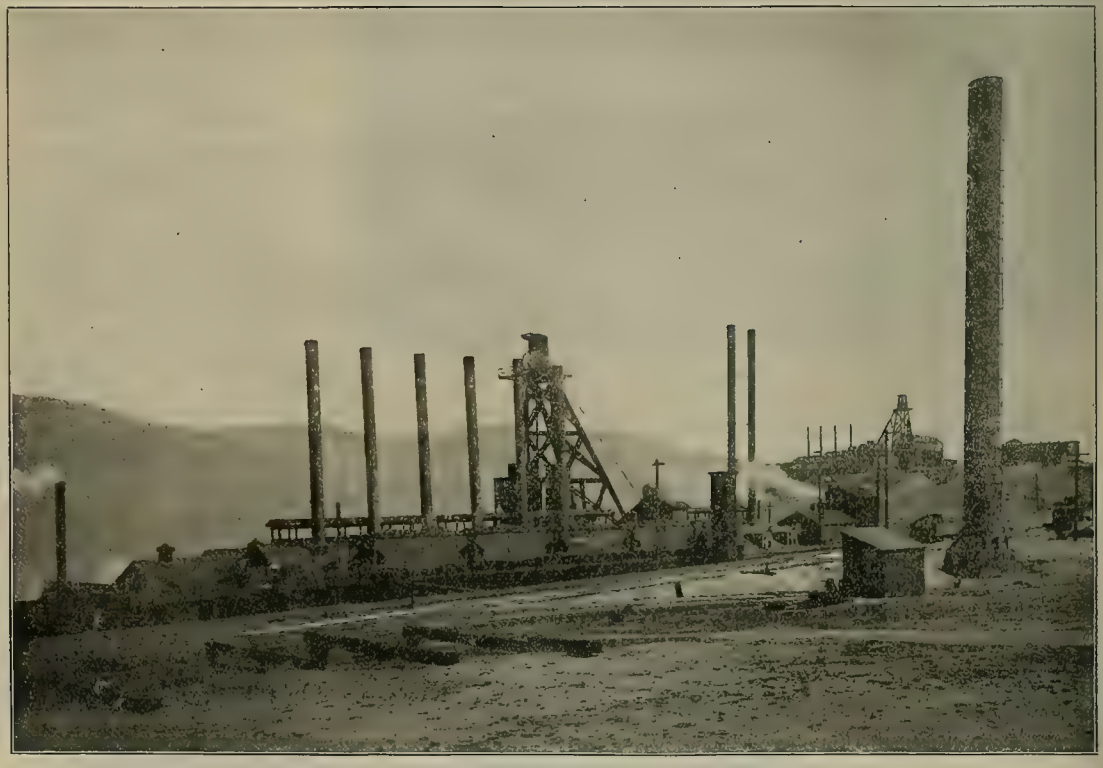
Copper at Butte, Montana.---III.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR H. HALLORAN.

The Butte & Boston Co. operates the Gray Rock, Silver Bow No. 1, and Berkeley mines, 1,000, 1,600 and 800 ft., three-compartment shafts, respectively. A Reidler pump on the 1,000-ft. level of the Silver Bow No. 1 can pump 800 gal. per min. to the surface. A 28-drill Nordberg compressor furnishes air for the Gray Rock. A new shaft is being sunk on the Tramway mine by the Red Metal and Butte & Boston jointly, which, when completed, will be used by both companies. Both own interests in the Tramway and Snohomish mines, and the Red Metal owns the Minnie Healey, which adjoins the Tramway and Snohomish.

The Trenton Mining & Milling Co. is operating the Clear Grit main two-compartment shaft is 600 ft. deep, with a 250-ft. winze. A $\frac{7}{8}$-in. round rope and bucket are used in hoisting. The two-compartment Cambers shaft is 200 ft. deep and employs a single-deck cage and 1 in. round cable for hoisting.

The Rarus, Minnie Healey, Belmont and Corra are classed together, because formerly owned by the Montana Ore Purchasing Co., now under the Red Metal Mining Co. They are closely associated with properties already described and are to be operated in conjunction with them. The Rarus and Minnie Healey shafts are three-compartment and 1,500 and 1,100 ft. deep. The Corra has two compartments for 800 ft. and three compartments for the remaining 1,000 ft. It is being sunk 400 ft. deeper. The Belmont has two compartments 900 ft. deep; it is to be deepened and used to work a part of the Anaconda mine. The Rarus pumping plant comprises one 500-gal.



High Ore and Mountain View Mines.

Gagnon mine. The shaft is inclined, has three compartments and is down 2,000 ft. Double-deck cages are used for handling the men, changing to three-ton skips for hoisting rock. The water is pumped by two Aldrich electric pumps, one with a capacity of 100 gal. per min. on the 2,000-ft. level and the other 200 gal. per min. at the 1,000-ft. level.

The Parrot and the Original No. 6 mines are being worked by the Parrot Silver & Copper Co., of which H. A. Gallway is manager and Dan. Griffin foreman. The Parrot three-compartment shaft is being sunk to 2,400 ft. The Original No. 6 two-compartment is down 1,000 ft. At the Parrot two double-deck cages, with ten-ton skips attached, hoist the ore and dump it automatically into the bins at the surface. An 80-drill Ingersoll-Sergeant and a 20-drill Rand compressor are in use.

The Washoe Copper Co. operates the Moonlight, Clear Grit and Cambers mines, doing most of their work at the Moonlight. The main shaft has three compartments and is 1,300 ft. deep. A 20 by 48 in. Dickson engine, with 6-in. flat cable, hoists two double-deck cages. The Worthington on the 800, one 420-gal. electric pump and a 500-gal. Jeanesville pump on the 1,300, a 500-gal. Knowles and two 250-gal. Camerons on the 1,400, and two 200-gal. Cameron sinkers in the shaft. Double-deck cages, with skips attached, and Webster, Camp & Lane hoists and flat cables are used at all the shafts except the Belmont.

The Lexington mine, a Heinze property operated by La France Mining Co., is said to have been transferred to the Butte Coalition. The main shaft is down 1,450 ft. A new Allis-Chalmers 20 by 60 in. cylinder hoist, using a $1\frac{1}{4}$ in. round rope and double-deck cages, is being installed. An 800-gal. centrifugal and two 400-gal. Aldrich pumps are expected to handle the water. It is likewise reported that the Alice mine at Walkerville, an old silver producer that shows copper at depth, has been transferred to the Butte Coalition. It has been mined to a depth of 1,500 feet.

The North Butte Mining Co., A. C. Carson, manager, is working the Speculator, Edith May, and Jessie mines through the Speculator shaft. This is down 1,600 ft.,

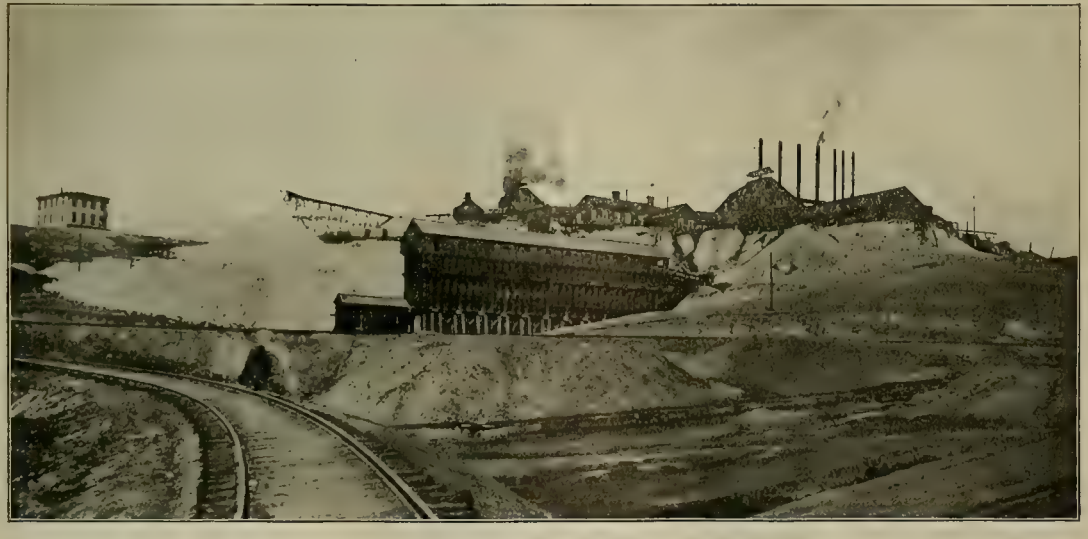
with three compartments, and has recently been re-timbered and has been connected at the 1,600-ft. level with the old Jessie shaft. This was originally down 330 ft. By sinking a winze 500 ft. and by raising 470 ft., the shaft was completed. A Nordberg engine, similar to sides and loading is done from but one side of the shaft. A 32 by 72 in. Nordberg engine and 1¼ in. round cable is used. In square-setting the stopes both round and square timbers are used, the round for posts and girts and the square for caps. Round timbers are larger at one end



Western Portion of Walkerville, a Suburb of Butte. Alice Mill and Mine in the Background.

that at the Leonard, and a new head-frame 127 ft. high, are now being completed. The company is also developing the Carlisle and Protection claims. This company is working farther north than any other copper producer; to its recent phenomenal success may be ascribed the formation of the numerous new companies during the past few months.

than at the other and give uneven floors. The square caps give good floors and catch the girts better. With the round caps the flooring is more apt to slip off than with the square caps. A number of accidents have been caused by planks sliding off round caps. The West Stew-



Belle and Diamond Mines.

The Original Mining & Smelting Co. is working the Original and West Stewart, W. A. Clark's properties, of which A. H. Wethey is general manager and Thomas Bryant superintendent. The Original shaft is down 2,200 ft., two compartments for 700 ft. and three compartments for 1,500 ft. Two double-deck cages with seven-ton skips are used. Sheet-iron sides inclose the cages on three art, down 1,900 ft., has a hoist similar to the Original. Tramming is done with horses and men. A 60-drill Ingersoll-Sergeant compressor furnishes air for both mines. Steel head-frames are above the shafts.

A. J. Coram and associates, of Boston, own a large number of claims in the centre of the town south of the Amalgamated properties. These are now being opened up by the Davis-Daly Estates Copper Co., which has given a contract to the Original Mining Co. to run a

cross-cut 3,500 ft. from the 1,800-ft. level of the Original mine. A shaft will be sunk to connect with the southern end of this cross-cut. Another shaft will be sunk on the Hesperus and a cross-cut driven north.

Out on the flat, east of Butte, the Pittsburgh & Montana Mining & Smelting Co. has been working a number of narrow high-grade veins. To reach these, the shaft had first to be sunk through 600 ft. of wash. The Pittsburgh & Montana Co. has two shafts, the Farrel No. 1 and 2, each down 1,200 ft. No. 1 shaft is at the smelter, No. 2 half a mile north, and all the property, surrounded by a 12-ft. black fence, is undermined with cross-cuts. The surface has been pegged out so as to give an accurate map of the underground workings. Mechanical stoking is used for the power plant. Two centrifugal pumps on the 1,200-ft. level of the Farrel No. 2, the main working shaft, throw 1,000 gal. per min. for 1,200 ft., one Knowles on the 700-ft. level pumps 500 gal. per minute.

The Reins Copper Co., working the Combination mine east of the Leonard, has a shaft down 1,200 ft. and has established stations at the 800 and 1,000 and 1,200 ft. levels from which cross-cuts have been run. At the 800, a Jeanesville and a Knowles each can pump 700 gal. per min., and at the 1,000 a Jeanesville and a Cameron can handle 400 gal. Two sinking pumps in the shaft complete this installation. At present they are pumping but 200 gal. per minute.

At Centerville, north of Butte, the Raven Mining Co. opened up the Raven and Snoozer claims by means of cross-cuts on the 800, 1,200 and 1,500 ft. levels from the Buffalo shaft. But the Amalgamated Co. has recently caused them to stop work. W. D. Thornton is president and John Berkin manager. This property is west of the Mountain Con. group of the Anaconda Company.

South of the Silver Bow mine of the Amalgamated Co. the East Butte Mining Co. has consolidated a number of claims whose upper levels are now being worked by lessees. These include the Lassen, Yankee Boy, Oneida, Mary McLane, Dutton, Jackson, McDonald, Hancock and Wheeler. Shafts have been sunk to a depth of 300 ft. and cross-cuts have opened up five east-west veins. Lessees are shipping 125 tons of high-grade ore daily that runs from 8 to 12% copper, on which the company is getting a royalty of 25%. The company has put in hoists and a 16-drill compressor at the Dutton and Yankee Boy, and will sink two shafts to a depth of 1,000 ft. within the next six months. Jas. W. Neill is consulting engineer and Patrick Wall general manager.

The companies working along the east edge of the flat are the Butte & London, sinking on the Greendale placer; the Butte Copper Exploration Co., on the Six O'Clock; the Boston & Montana, on the Greenleaf; and the General Development Co., on the Altoona. The Venture Corporation of London is said to own a controlling interest in the Butte & London Copper Development Co. This company is sinking a shaft through the wash to bedrock. When a depth of 1,500 ft. is gained, a cross-cut will be run to tap veins believed to be there. Southeast of the Butte & London, the Butte Copper Exploration Co. unwatered the 400-ft. shaft at the Six O'Clock and will sink it to a depth of 1,000 ft., cross-cutting at intervals to prospect the country. South of this shaft, the Amalgamated has been sinking a shaft on the Greenleaf since last November.

The General Development Co., backed by the Lewisohns and engineered by J. Parke Channing, unwatered the Altoona shaft southeast of the Pittsmont, preparatory to opening up the Amazon group. Options have been taken on many other claims, high-grade copper ore having been found in many places in the east belt. The Butte Copper Belt Mining Co. also is prospecting some of this ground.

Far north of any copper producers, toward the head of the Yankee Doodle gulch, the Butte & Bacorn Co. has nearly 400 acres of promising ground. Three shafts are being sunk and hoisting engines installed at the Colleen Bawn, Belinda and Calumet. Numerous veins can be traced throughout this territory. Although little copper is found on the surface, yet, following the analogy of the mines on Anaconda hill, it is argued that chalcocite will be found in depth. It is probable that the copper has been leached out in the zone of oxidation and re-precipitated on pyrite by descending solutions. If this be the case, this section should be as important a producer as the mines on the hill, for surface work has shown the veins are strong and well defined. Where the circulation has been poor, as in the 'gouge' on either wall, good copper values are found. Edward Renouard has charge of the work. The same lode is being explored by the Butte Hill Copper Mining Company.

The Butte-Montana Mining Co. is working the Alec Scott, the only claim on Anaconda hill not owned by the Amalgamated interests or those friendly to them. The shaft is down 680 ft. and sinking is to be started as soon as a new hoist and boilers can be but in. The company also owns the Little Annie claim near the Goldsmith. W. J. Dawson is superintendent. The Butte-Milwaukee Co. is sinking on the Stonewall and on the Pollock in the North Butte district. The East Butte Extension Co., the Alliance Copper Co., and the Northeast Butte Copper Co. are working in the East Butte section. The Butte & St. Louis Mining Co. is working the Kessler property in North Walkerville.

The Butte Commercial Copper Mining and Development Co., the Butte Central Copper & Smelting Co., and the North Butte Mountain Copper Co., are among the latest companies incorporated. The West Butte Mining Co. has taken over half a dozen claims under option, in addition to the purchase of the Columbia, on which the original capitalization was based. The Butte & Veronica Mining Co. owns 12 acres of ground west and south of the Belmont mine.

All of these companies, including the East Butte, have been formed within the past six months. Their formation, flotation and operation is today one of the most remarkable features of Butte. Since the wonderful showing of North Butte, public interest has been aroused in the possibilities of mining outside of the 'mile limit.' This in itself is laudable; but it is accompanied by a general dabbling in stocks. The population of Butte is becoming stock mad. Secretaries of mining companies are among the few who here violate the rules of eight-hour labor; they are feverishly at work endeavoring to write out certificates of stock fast enough to supply the public demand. This demand is universal among all classes. The bank president places a large order at the same time that his stenographer and office boy take their weekly earnings to the 'bucket shop.' The mine-owner and the mine-worker both hold stock in the same company. Many are putting their all on a margin, in the hopes of a rise. This is deplorable. Butte copper shares are surely on a rise, yet they can easily be controlled by an unscrupulous few, to the imminent danger of the small speculator. At all times and at all places among men, women and children, the one topic of conversation for the past ten months has been mining stocks. There are few school-teachers that do not own a share in at least one hole in ground. The ladies glibly discuss the strange terms of the stock-exchange over their tea-tables. Anyone having a 'tip' is sure of a welcome. The children on the streets can tell the market value of some share in which their parents are gambling. It is not my place to moralize on this condition. Some will gain and some will lose. Butte may be an exception, for she points

with pride to her past record of never having had a 'wild-cat.' The money is now going into the ground.

This stock gambling is but one of the contrasts presented by this overgrown mining camp, just waking to a realization of its size and strength. For the civic league has "shut out the tiger"; 'tin-horn' gamblers are almost the only professional men out of a job; poker is under a ban. To a visitor this seems inconsistent. Among those now most strongly opposing the existence of a "wide open town" are men who are risking everything on the rise of stocks.

As for suffering families, there are few here to be affected. Butte is a man's town, rude, strong and careless. Every day eight thousand men come up from underground and pour out through the streets into the saloons and lodging houses. Two thousand more come from the various surface workings. The rest of Butte's great population live from the wages of this basic class. Muckers get $3.50 per day, and every other worker in ascending proportion. Men of every nation have floated to this cosmopolis; Austrians and Italians are herded in cheap tenements, Swedes and Norwegians are colonized in boarding houses, Welshmen and Cornishmen congregate clannishly, but the Irishman is generally the boss. He is a remnant of the old Marcus Daly days, big, powerful, overbearing—a driver of men. But right in his midst is growing up his master. Young men from every mining school in the land are toiling with the muckers, miners and timbermen, "getting their experience." Soon, as shift-bosses, foremen and superintendents, they will be more intelligently extracting this great amount of ore, even now aggregating 3,500 tons daily.

Because of the necessity of amusing this conglomeration, Butte is the best 'show town' of its size in the country. It patronizes them all, from the high-class opera to the low-down music hall, impartially too, for one finds the Italian car pusher at the opera, and the consulting engineer at the music hall, drinking his beer with the rest of the boys. St. Patrick's Day, Fourth of July, Labor Day, and Christmas are the great holidays, generally rendered memorable by a prize-fight, a horse-race or coursing. Big dinners and big drinks are the favorite means of entertainment. Because of the winter cold, many of the men are clad in furs, and diamonds flash from their fingers and ties more frequently than they do from the women elsewhere.

As a town Butte presents a queer jumble of unpainted shacks and magnificent steel buildings, all built helter-skelter around some tall gallows-frame or smokestack. A miner often lives within ten yards of his own little shaft, his cows and chickens running over his dump, the week's wash hung from the head-frame and fluttering in the mingled coal smoke and smelter fume. First laid out as roads, the streets are a tortuous perplexing maze, skirting waste-dumps, veering from high board fences around some shaft, and all following the rough contour of gulch and hill. Sight is often unavailing because of thick clouds of fume and fog, yet the locomotive's shriek, the engine's exhaust, the cable rattling over the sheaves, the piano's jangle, continually greet the ear, and the mingled odors of sulphur, coal, whisky, and garlic assail the nostril, each guiding one wheresoever he desires.

Night and day the streets and hills are alive with men, coming off or going on one of the three shifts. On a bright day the congestion of humanity often renders progress slow. From a distance the town is prettiest by night with the myriads of electric lights dotted over the hills, sudden brilliant glowings marking the lurid path of the molten slag from the smelters.

WITHOUT SPECULATION there is no good and original observation.

Tests for Tellurium.

In the *Monthly Journal* of the Chamber of Mines, Western Australia, Mr. H. B. Wright gives the several tests for tellurium in the presence of pyrite, he describes them thus:

1. The usual and very delicate test for the detection of tellurium occurring as a telluride, that of heating a little of the finely powdered mineral with strong sulphuric acid and securing a reddish-violet coloration of tellurium sulph-oxide, fails when applied in the presence of pyrites. This is due to the reducing action of sulphur dioxide, which is liberated when iron pyrite is heated with strong sulphuric acid.

2. The sodium-amalgam test also fails in the presence of pyrite, the sodium sulphide formed in the re-action destroying the reddish-violet coloration of tellurium sulph-oxide.

3. Oxidizing the pyrite with strong nitric acid, evaporating to dryness, boiling with caustic soda to dissolve the tellurous oxide formed, and precipitating the bases as hydrates and filtering to obtain the tellurium as sodium tellurite is also unsuccessful, as the tellurium is precipitated in combination with the iron.

4. The most reliable test for detecting even traces of tellurium in the presence of much pyrite is as follows:

Thoroughly oxidize the pyrite with strong nitric acid, evaporate to dryness, take up with strong hydrochloric acid, boil, dilute with water, and filter off the insoluble residue.

Through the filtrate made boiling, pass a rapid stream of sulphur-dioxide until the filtrate is thoroughly saturated with the gas; the tellurium and any gold will be precipitated in the metallic state. Filter off the tellurium (and any gold), wash with water until free from the salts of the filtrate. Wash the tellurium from the filter-paper into a small evaporating basin, evaporate just to dryness, and then add strong sulphuric acid and warm gradually; should tellurium be present, the violet-red coloration will rapidly develop.

This test, though somewhat lengthy, more than repays the operator for the trouble occasioned. It entirely removes any doubts which 1, 2 and 3 are almost certain to produce.

THE Greenwich observatory is seriously affected by the new main power-station of the London County Council electric railway system. The power-station is about half a mile distant from the observatory and almost due north. It is to have an ultimate capacity of about 50,000 h.p., but only part of the machinery is installed and not more than 3,000 h.p. is generated at the maximum; vertical engines are used. The vibration produced by the engine is noticed strongly at the observatory. The instrument most particularly affected up to the present is a portable transit used for longitude work. Trouble is also caused by the smoke and hot gases issuing from the stacks of the power-station, which give rise to disturbing refraction effects. An investigation is to be made by the British Admiralty and the London County Council to determine the nature and degree of the disturbance and how it may be remedied.

AS NO MAN fording a stream can dip his foot twice into the same water, so no man can, with exactness, affirm of anything in the sensible world that it is. As he utters the words, nay, as he thinks them, the predicate ceases to be applicable; the present has become the past; the 'is' should be 'was.' And the more we learn of the nature of things, the more evident it is that what we call rest is unperceived activity; that seeming peace is silent but strenuous battle.

A Quick Vertical-Shaft Survey.

Written for the MINING AND SCIENTIFIC PRESS
By W. E. DOWNS.

This article deals with the method I have used for 15 years in making quick and accurate surveys of various vertical shafts in Amador and other counties along the Mother Lode of California.

The essential features of the method are the use of heavy plummet lines and 'bobs,' hanging free, while being set, but securely fastened while observations are being taken. I can best illustrate the operation of this method by citing an actual case, that of my survey of the Oneida vertical shaft in six hours on July 6, 1902. This main working shaft of the mine was sunk 1,000 ft. east of the outcrop and intersected the vein, which dips to the east, 1,900 ft. below the surface. The vein was then being worked through six levels at 1,200, 1,500, 1,700, 1,800, 1,900, and 2,000 ft., vertically below the collar of the shaft.

The adverse conditions under which this survey was made were: A very wet shaft, through which water literally poured in torrents; a shaft distorted and narrowed by swelling ground at the 1,800-ft. level, and a shaft with an excessive number of working levels into each of which the survey had to be tied from one hanging of the plumb-bobs and as quickly as was consistent with good work, so as to interfere as little as possible with the regular operation of the mine and the use of the shaft.

To overcome these adverse conditions, two large-sized (No. 12 gauge), soft-drawn iron wires were suspended in the centre compartment of the shaft, with a 125-lb. plumb-bob attached to each, less than one foot below the 2,000-ft. level, the wires sliding from the surface with the bobs attached, through notches in plank. At the 2,000-ft. station, opposite each wire, a template, made from a piece of candle-box, was so placed and fastened with a wire-nail at one end that the free end could be swung or moved to or from the wire in a horizontal direction practically in line with both wires. By the interposition of a small piece of wood laid loosely upon each template, with its end projecting over, and in contact with, the advancing side of the oscillating wire, the latter was brought to rest after the retardation of a very few oscillations. The position of rest was then carefully marked on the template. As the oscillations diminished, the template was brought closer to the wire until finally, when the latter was at rest, the template was brought in contact with it and nailed in place. The wire was then fastened to the template from underneath, in the position of permanent rest.

Seven settings with a transit were made, one at each station and one at the collar of the shaft—all in the same vertical plane. In each instance the instrument was set, by the 'cut and try' method, as near the nearest wire as the minimum focal distance (about six feet) of the telescope would permit, with a lighted candle in range beyond the farther wire. When in this position, the telescope may be focused on either wire at will without any interference from the other wire and accurately adjusted to the exact plane of both; this was done in each instance. The slightest sidewise tremor of either wire, which neither lasted long nor caused serious delay, was readily detected. From each setting wire-nails were accurately centred on line and driven into solidly placed track-ties, plugs, timbers, or planks, and steel-tape measurements to the nearest hundredth of a foot made to locate them with reference to the wires—all in the same vertical plane. Subsequently, from these nails, courses were extended by deflection throughout each level and to the previously established surface boundaries and all necessary measurements made, whereby the position of each point, or instrument-station, in the whole system was determined with reference to every other point. From these data the entire system was accurately mapped and the field-notes tabulated for future reference, so that the survey could be extended and mapped as development work progressed.

In this survey the horizontal distances between plummet-wire centres were respectively: 2.43 ft. at the collar, 2.44 ft. at the 1,200-ft. level, and 2.45 ft. at the 2,000-ft. level. The divergence of these wires downward is due to but one cause, which is purely gravitational. The mass of rock that would have to be in place between the wires to have them hang parallel or more theoretically to converge toward the centre of the earth, was absent, and of course the wires came to rest, diverging slightly downward. Drafts and falling water in the shaft do not have any effect upon the sum total of this divergence, although they do create tremors and also operate to check the same.

In contrast with the hard-drawn piano-wire method of hanging bobs of necessarily light weight in molasses or some other viscous liquid, this method has no equal; it is quick and reliable, it has proved so to my entire satisfaction in numerous instances where I have made surveys for underground connections.

A plummet line of large-sized soft-drawn wire has two decided advantages over one of small-sized hard-drawn wire; they are as follows:

First. In the process of hanging wire, all kinks and internal strains are absolutely removed by stretching, leaving the wire perfectly straight, a condition impossible with hard-drawn wire wherein kinks and strains are left, subjecting the wire to local wobbles nearly as great as the diameter of the wire itself.

Second. As external disturbances, due to drafts and falling water, are of a magnitude proportionate to the exposed surface of the wire, and as the strength of a wire is proportional to the square of its circumference and therefore to the square of its exposed surface, it is plain, although a hard-drawn wire is stronger per unit of cross-sectional area than a soft-drawn wire, that if the difference in size is great enough, a large soft-drawn wire is better adapted to withstand said disturbances than a small hard-drawn wire. The so-called advantage of being able to bisect a small-sized wire with the vertical cross-hair of the instrument better than a large-sized wire is in practice a myth, particularly when contrasted with our first advantage.

The bobs must be symmetrically made, preferably of solid shafting accurately turned in a lathe and centred with an eye at one end to receive the plummet wire which must be a continuation when suspended of the axis of the bob, so that there will be no local wobbles in the wire when the bob revolves, which it will do to a small extent.

IT has been claimed that the gold-bearing veins of the southern Black Hills of South Dakota are unaccompanied by intrusive rocks of any kind — that no igneous rocks are found in the Black Hills south of the Lawrence county line. This is an error, for at and near Rochford, on Castle creek, and throughout the region of gold mines as far south as Spring creek, are found numerous dikes of diorite and diabase, probably all of Algonkian time, which merely shows that ore-forming processes were similar in pre-Cambrian time to those of the later periods, when the intrusives were generally more acid in character. In southern Pennington county and in Custer county are found many intrusive granite dikes (pegmatite), some of which are associated with gold-bearing quartz lenses and occasionally the pegmatite is itself gold bearing.

Haulage in Iron Mines of Alabama.

Written for the Mining and Scientific Press
By W. R. Crane.

Of the many improvements inaugurated in the hard iron-ore mines of the Birmingham district, none are of more importance, considered from the standpoint of economy, than those that have to do with haulage and handling of the ore, both on the surface and underground. The change made in methods of mining, from stripping to underground working, necessitated a radical departure; with an increase in depth still further changes have been made, so that at the present time it would seem that a practicable economic limit has been reached.

During the period of open-cut work the ore was transferred by systems of rope-haulage from the outcrop at the top of the mountain (Red) to the level ground at its foot. Occasionally it was shot down in chutes. Later, lines of railroad were laid along the flanks of the mountains at such levels as to permit the ore to be drawn directly from the tipples, which are provided with storage-bins; and this is the system largely employed at the present time. (See Fig. 1.) The tipples are extensions of the main haulage-ways or slopes leading from the underground workings. Often, two or more slopes were connected by surface lines of haulage, either extending along the line of the stripping or on the waste-banks; usually one engine served a double purpose—that is, it furnished motive-power for the horizontal hauls and for the planes in transferring from one level to another to accommodate loading into the railroad cars.



Fig. 1. Tipple, With Skip in Act of Dumping.

As stated, mining was formerly done by open-cut, the work being done largely by hand; and, although such work is still carried on at favorable points, underground work is now almost universal. The room-and-pillar system is employed; this is done in two operations—namely, forming pillars on the advance and robbing them when retreating. The mines are opened by inclined shafts, but as the inclination is usually moderate (about 20 deg.), they are more appropriately called slope-mines. The pitch of the ore-stratum is variable in both horizontal and vertical directions, by reason of change in direction of strike. Usually at a point from 100 to 150 ft. from the outcrop, the pitch changes abruptly, becoming much steeper. (See Fig. 2.) These sudden changes in grade are called 'nuckles' and necessitate slower haulage.

The handling of the ore, delivered to the slopes in the pit-cars, is accomplished either by car or skip—preferably the latter. Cars were employed during the early period of underground mining and they are still in use in a few mines, but skip-haulage has been found to afford increased capacity at lower cost, it requires fewer attendants (ratio, 1 to 8), and it simplifies mining and management. The choice of system determines the method of mine development.

The development work consists in driving passages called 'headings' from either side of the main slopes. These headings must be given proper grade for haulage, usually 3 to 4% in favor of the loaded cars. To maintain the grade, and still keep within the ore, it is often necessary to make the heading irregular. The angles of intersection of headings and slopes are often acute, owing to the effort made to maintain the desired grade, which may seriously affect the haulage of trains of cars from headings to slopes.

When car-haulage is employed, on the slopes, it is found advantageous to off-set or 'stagger' the openings of the headings on the slopes, in order that switches on opposite sides may not come at the same points on the slope-track, thus simplifying the operation of switching as well as the laying of the switches. The off-sets range from 15 to 25 ft., but vary with the height of the lift. Further, with car-haulage the headings connect with the slopes by means of upward curved passages, as in slope-haulage in coal mines, while with skip-haulage there is no connecting tracks between headings and slopes—the headings being driven from the slopes at right-angles. Little or no off-setting is done with skip-haulage, the headings being practically opposite each other. When skips are employed it is necessary to depress the slope-tracks in order that the skips may receive their loads from the pit-cars operating in the headings, which necessitates the running of the slopes in the underlying formations. If the lower bench of the ore-bed is soft, only the upper portion will be worked, the stopes being driven the full height of the stratum. A change in the system of haulage requires a lifting of the bottom of the slope, thus materially increasing its height—the headings remaining unchanged, save from the arrangement of the tracks. The depression of the slope-track for skip-haulage is 8 ft. 6 in. below the heading-track.

The skips have capacities ranging from 8 to 15 tons; they are made of steel, and are open at both top and front. The fore-end is, however, provided with a gate, G, which is kept closed during haulage by the bail acting on two arched ribs, E (Fig. 3), and is in turn freed at the instant of dumping by the raising of the bail. The partings in the headings, adjacent to the slopes, are usually provided with two tracks to accommodate empty and loaded cars, thus facilitating handling.

With car-haulage, trains of five to eight cars are hauled from the partings, where they are made up, onto the slope, thence to the surface, and are returned in like manner, the switches being set to turn the cars into a given heading. The acute angles and consequent short curves, often formed by headings with slopes, renders the transference of trains of cars, either way, extremely difficult. Deflecting sheaves, employed on the upper ribs of the headings, facilitate the passing of the cars, but do not by any means remedy the evil.

Formerly wooden cars, iron-bound, were employed almost exclusively both for mine and slope-haulage, while at the present time metal cars are rapidly replacing the wooden forms. These cars have a capacity of about two tons and operate on 36 to 42 in. gauges—the former for wooden, the latter for metal cars.

In hard-ore mining the pit-cars are filled by shovel, being uncoupled and handled separately. Cradle-dumping of whole trains of cars, without breaking connections with the winding-rope, is occasionally employed.

When skip-haulage is the practice, the tipples are built close to the mouth of the slope and are given the inclination of the upper portion of the slope. Above the main tipple-track is built an elevated track, with a gauge of 70 in., or 10 in. greater than the slope or tipple-track below. This track stands 4½ to 5 ft. above the floor of the tipple, is strongly built and braced, and is connected with the tipple at the lower end by a section of track, *D* (Fig. 1), of considerably steeper grade. Surmounting the elevated track in turn is a wheel-guard, *L*, which stands above the rail, a distance slightly greater than the diameter of the rear wheels of the skip that run upon the track. The skips are provided with 24-in. wheels, which run upon the 60-in. slope-track. The rear wheels are double—that

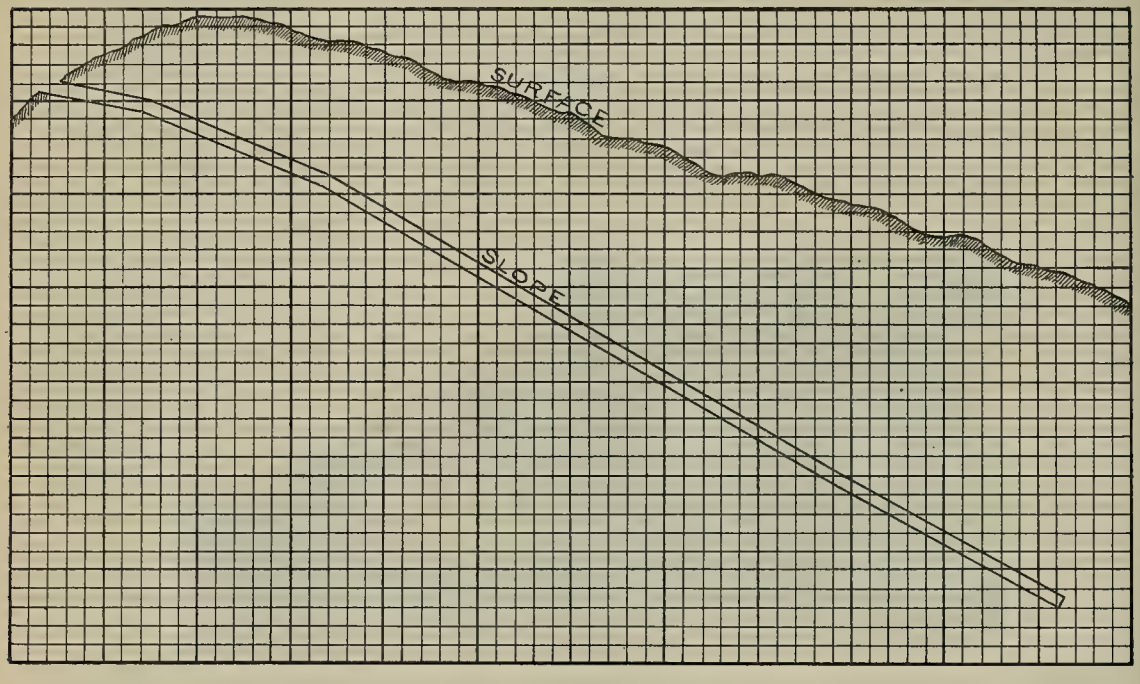


Fig. 2. Sectional Elevation Showing Relation of Slope to Surface. Scale 1 : 1200

while standing on the heading tracks at the foot or bottom of the lifts, while branch tracks are often found to be necessary when soft ore is mined, and especially when the working face has advanced to the top of the lift. With moderate pitches these branch tracks can be run for at least one-half the height of the lift. The reason for the difference in arrangement of tracks in headings and rooms is due to the marked difference in character of ore and consequent variations in angles of repose—the hard ore breaks coarse and readily finds its way to the heading tracks, while the soft ore breaks fine and is moved with difficulty, especially on slight inclinations. The gauge of the skip-track is 60 in., weights of rails for cars and skips are 30 and 60 lb. per yard.

Prior to the employment of skip-haulage, rather elaborate systems of handling and emptying cars were employed. Switch-backs connecting the mine slopes with the tipples were the rule. Double-engine plane haulage was also common—that is, hauling up the mine-slope to the surface, then transferring the cars down the face of the mountain to the railroad-track, which arrangement often resulted in a combination of engine and gravity planes. As a usual thing, the surface ends of the haulage systems terminate on a tipple upon which the cars are run and dumped. Hand-dumping is in vogue, the cars is, they have small side or hub-wheels of 12-in. diam., mounted upon the same axle as the regular wheels, which give them a double tread, so that when the skip reaches the tipple the fore-wheels maintain their position upon the main track, while the hub-wheels strike the inclined section of track, *D*, leading to the elevated track and mount upon it, thus securely and readily changing or reversing the inclination of the bottom of the skip. The inclination thus given, or the dumping-pitch, is about 40 deg. The gate at the front of the skip, which up to this time has been held tightly closed by the cross-bar of the bail, is freed by the change in position of the body of the skip and swings or is pushed open by the discharge of the skip's contents—the discharged material entering the ore-bin below.

To permit dumping at several points, two at least, as in the ore-bin, *A*, and the waste-chute, *B*, a change in inclination of the skip must be effected at a point below that necessary for dumping ore, which in this particular case is directly above the waste-chute, *B*. A second section of track, *C*, is then provided, which also connects the main and elevated tracks, as previously described. To permit the use of the track, *D*, a break is made in the elevated track just above and back of the point where the two join, also in the first inclined section or approach,

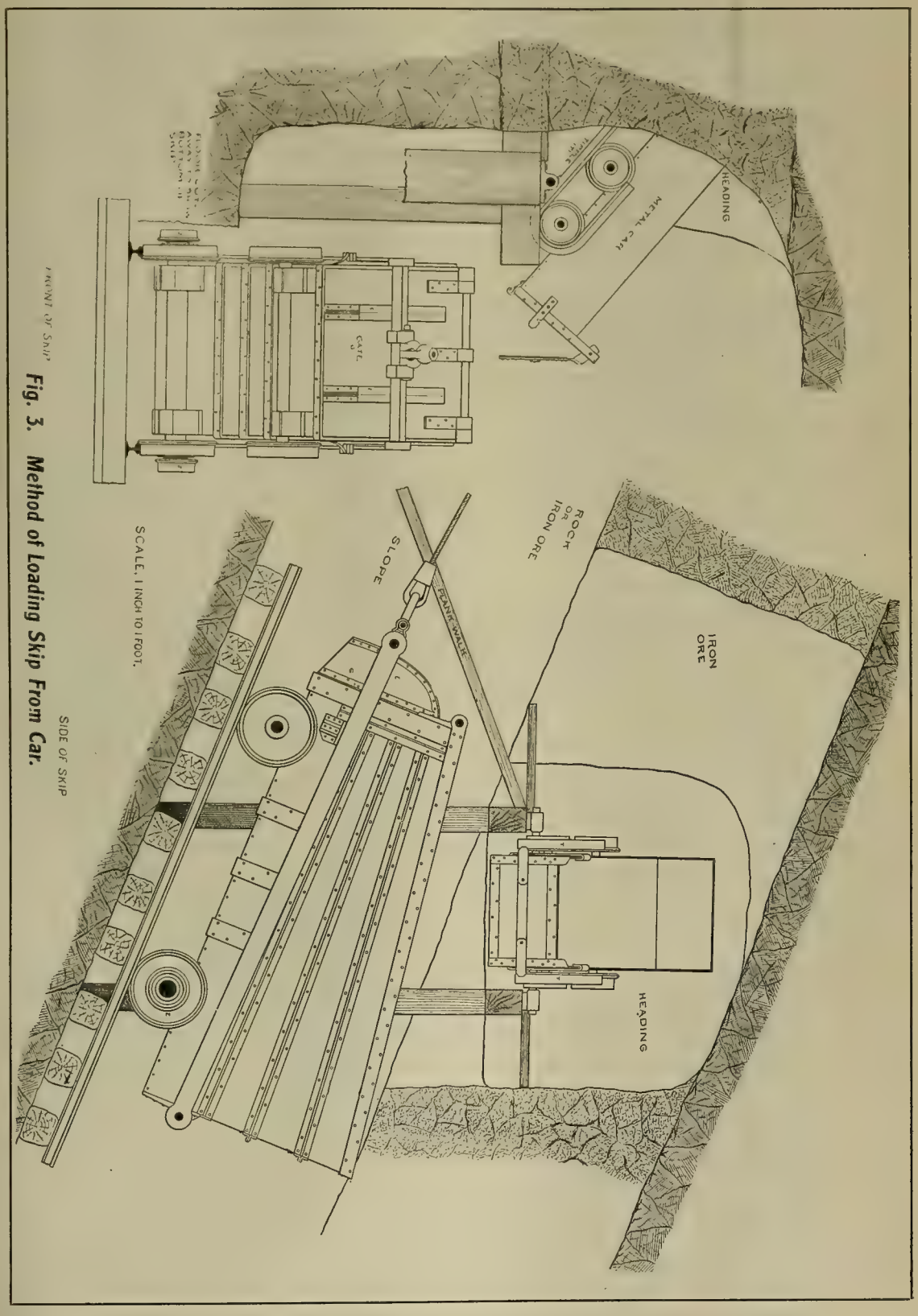


Fig. 3. Method of Loading Skip From Car.

C, to the elevated track, both of which are provided with portions of track, *E* and *F*, hinged so that they can be raised, thus allowing the hub-wheels to pass *C*, or lowered, throwing the travel on *C*. It is evident that by means of the approaches, *C* and *D*, and the hinged portions of track, *E* and *F*, which are in reality switches, the contents of a skip can be readily discharged either into the ore-bin or waste-chute, as desired.

When the slope is being sunk simultaneously with the work of extraction of ore, the waste obtained from the sinking operations is handled in a second or trail skip, which is connected with the main skip through some 30 ft. of wire rope, and is thus lowered to the bottom of the slope and hauled to the surface with its load, both acting together. By a careful manipulation of the switches, E and F, the two skips can be made to discharge their contents into their respective places with little loss of time.

Change in method of handling ore, both below and above ground has been largely instrumental in bringing about a radical improvement in the power equipment. Centralization of power plants (air, steam, and electric) has resulted in increased output with a material reduction in cost. Air and steam, especially the former, are often piped from a central station for considerable distances to adjacent mines. Usually, however, each mine has its own steam-plant for furnishing power for winding and reduction purposes. Second-motion hoists equipped with 10 to 12-ft. drums, with post-brakes, and having a capacity of 50 to 100 tons per hour are in common use. Steel cables $1\frac{1}{8}$ and $1\frac{3}{4}$ in. diam. are used for slope winding.

Owing to the steepness of the mountain upon which the ore outcrops, it is often necessary for the tipple and hoist to be far apart, thus necessitating intermediate supports to reduce swaying of the winding ropes. The tipples proper are trestle constructions, the main floors of which have the same inclination as the slopes. They are made of bents strongly braced by levelers and diagonals; they contain the large ore-bins, which are really only feed-hoppers for the crushers situated below, and waste-chutes (see Fig. 1). Directly below the ore-bin is a large spindle crusher, which is supported by the same trestle-work construction that contains and supports the bin, waste-chute and dumping-track. Gates improved No. 8 crushers are largely used; they are operated single or double-eye, that is, with one-half or the whole of the hopper-space open for the passage of ore, according to the capacity desired. They require about 30 h.p. to drive them, and reduce mine-run ore to $2\frac{1}{2}$ inches.

Although the occurrence of the ore strata and the methods employed do not present any serious obstacles to the handling and haulage of the mine product, yet the extent of the operations, with respect to number of mines owned and operated by a single company, necessitates a large and efficient working force, well organized. That the work is carried on smoothly speaks well for the management.*

THE ORE of Rio Tinto, Spain, contains about three per cent copper disseminated in the form of copper sulphide (chalcocite), in massive iron pyrite, presumably by secondary enrichment. Great heaps of the mineral, as it comes from the mine, are allowed to oxidize under the influences of the weather, the copper sulphate thus formed being subsequently washed out by water and precipitated on iron. The success of this method of treatment is due to the fact that the copper occurs as glance, and not as chalcopyrite, which oxidizes very slowly in the atmosphere.

*For the outline showing method of handling ore in the mine, the writer is indebted to the Tennessee Coal, Iron & Railroad Company.

Canada's Nickel Deposits.

Written for the MINING AND SCIENTIFIC PRESS
By J. A. MACDONALD.

The report which Dr. Haanel, Superintendent of Mines for the Dominion Government, has prepared for the Minister of the Interior regarding the experiments in electric smelting recently conducted at Sault Ste. Marie is of exceptional interest to the Canadian mining industries. If what Dr. Haanel says is true, that the process of electric smelting, invented by Dr. Heroult, is a commercial success, there is no doubt that mining will be given a new impetus. Particularly will this be so at Sault Ste. Marie.

In the Sudbury district of Ontario there exists the greatest nickel mines in the world. The average Canadian, Englishman and American possibly is not aware that Canada is the biggest producer of nickel ore. According to a statement from the Geological Survey, the value of the nickel output in Canada in 1905 was $7,550,526, or a little over 11% of the total mineral production of the country. There was an increase of $3,331,373 as compared with the previous years. Out of the total production of 18,876,315 lb. in 1905, 17,218,059 lb. were exported to the United States and Great Britain.

The story of nickel mining in the Sudbury district is interesting, much more so than the ordinary person would suppose. It was in 1846 that nickel was first discovered at the Wallace mine. The interest aroused at the time soon died away, and it was not until ten years later that attention was again called to it by the discovery of large quantities of nickel and copper six miles north of White Fish lake, and near the present Creighton mine, probably the largest deposit of nickeliferous pyrrhotite ever discovered. This discovery also aroused but little interest, and not until the construction of the Canadian Pacific Railway did operations begin in earnest. Then inside of ten years, all the mines which are now in operation were located. In 1886 the Canadian Copper Company was formed with a subscribed and paid-up capital of $2,000,000, afterward increased to $2,500,000, to work a number of the larger mines. This was the first combination of capital and skill which seriously undertook mining in the Sudbury district. The first blast-furnace was blown in during December, 1888. A second one was installed in the following year. During these years numerous mines were located and operations begun, only to be abandoned a short while later for want of capital. The famous Creighton mine was opened in July, 1900. It is undoubtedly the largest in the district, and from the very beginning of operations has produced large quantities of almost pure sulphide, with little or no rocky admixture. The Creighton mine is at present the main source of supply, its equipment permitting a production of between 500 and 600 tons of ore per day.

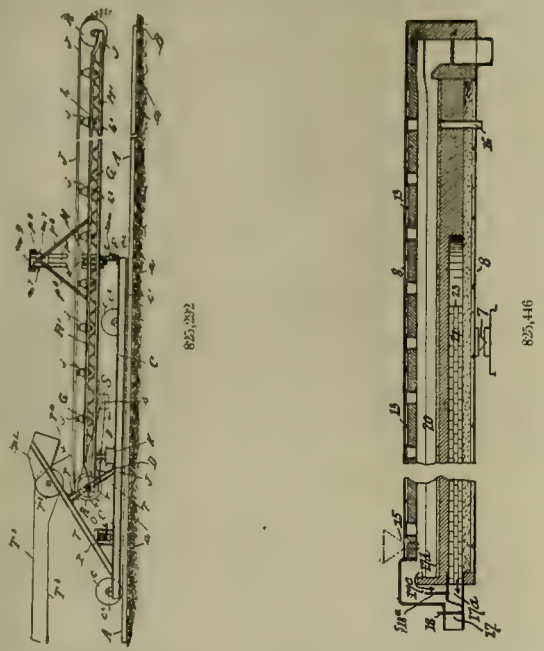
Since the organization of the Canadian Copper Company a dozen other companies have been organized, but most of them have faded away, in the majority of cases because of a lack or waste of capital, owing to absence of business and judgment, and the need of technical knowledge of the difficulties to be encountered in both the mining and smelting departments. In many cases all the available capital was utilized in costly experiments to discover new methods of smelting or refining. The history of the development of mining in the Sudbury district includes a long list of brilliant successes, but the failures bring into strong relief the gallant and successful struggle of the only company that has been able until recently to surmount the numerous difficulties. The crisis, however, is now past and the industry has been established on a firm basis.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

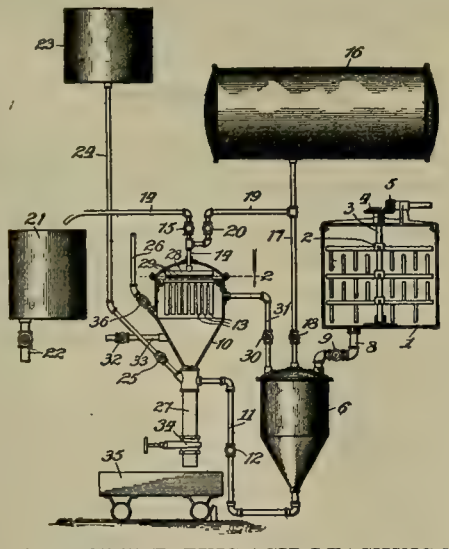
MEANS FOR DISTRIBUTING MINE RESIDUES.—No. 825,292; August L. E. Bergert, Johannesburg, Transvaal.

In apparatus of the nature specified, a conveyor belt and a boom supporting said belt, said boom being capable of swinging in a plane the angle of which to the horizontal is constant and of oscillating about its longitudinal axis.



APPARATUS FOR TREATING SLIMES.—No. 826,390; Carlos W. Van Law, Guanajuata, Mexico.

In an apparatus of the class described, the combination of a filtering-tank and a slimes-pressure tank, means for forcing slimes from the pressure-tank to the filtering-tank and through the filter by air at pressure above normal, means for equalizing the pressure in the tanks, and means for subjecting the interior of the filter to air at pressure above normal.



PROCESS OF TREATING ACID LEACHING SOLUTIONS.—No. 825,302; Percy F. Cowing, New York.

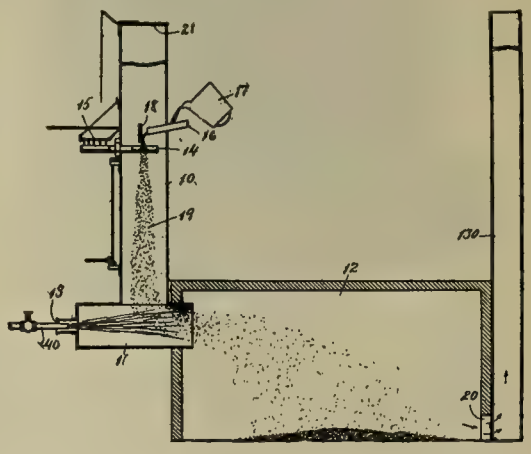
A process of treating pyrite containing iron in addition to metals incapable of remaining in a mineral-acid solution in the presence of hydrogen sulphide, which consists in fusing said pyrite in the presence of metallic iron and in the absence of air or oxygen, and finally subjecting the product produced by such fusion to the action of an acid-leaching solution containing a metal whose sulphide is insoluble in the acid in the presence of hydrogen sulphide, whereby hydrogen sulphide is evolved, the iron goes into solution, and the other metals in the product and leaching solution are precipitated or left out of solution.

TILTING ORE-ROASTING FURNACE.—No. 825,446; Thomas Edwards, Ballarat, Victoria, Australia.

An ore-roasting furnace, having a pair of longitudinal chambers, one above the other, and a connection between them, the upper chamber being for ore, a plurality of lines of rabbles in the upper chamber having the intersecting hearth areas, the said lower chamber having the longitudinally extending partition therein and dampers controlling the fume outlets of the said chambers.

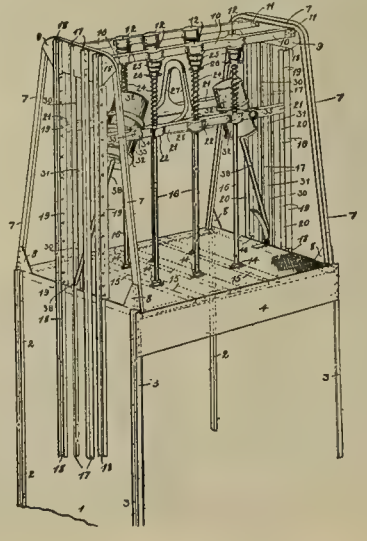
METHOD OF TREATING COPPER AND NICKEL MATTE.—No. 826,099; John A. Gilman, West Fairlee, Vermont.

Proceess for treating copper and nickel mattes which consists in finely subdividing the matte while in a molten state, projecting the particles in a stream downwardly by gravity, and blowing the stream laterally with a current of air to remove the sulphur of the particles.



SAFETY GEAR FOR MINE SKIPS AND CAGES.—No. 825,353; Bruno Schlesinger and Edwin G. Weldon, Johannesburg, Transvaal.

In safety gear for mine skips, cages and the like, in combination, a cage or skip, an oscillating cylinder carried by said cage or skip, a piston arranged in said cylinder, a piston rod attached to the piston and means which operate when the support for the load is removed to bring said piston rod into engagement with teeth, projections or recesses in the guide-rails or runners of the shaft, well or the like.

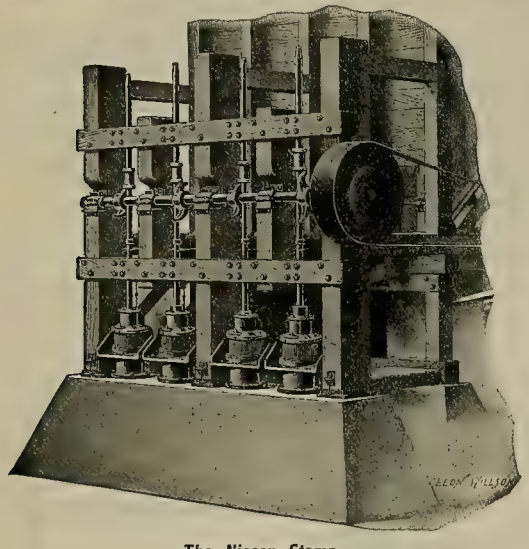


The Nissen Stamp.

Written for the MINING AND SCIENTIFIC PRESS
By PETER N. NISSEN.

The largest gravity stamp-mill in the world is to be built at Garfield, in Utah, by the Boston Consolidated Mining Co., for the crushing and concentration of ore from its great low-grade copper mines at Bingham.

After severe tests, conducted for a period of over six months, by Mr. A. J. Bettles, the contract was awarded to Messrs. Fairbanks, Morse & Co. for the installation of 360 Nissen independent stamps, with a provision in the contract that a further number of 360 stamps shall be added after completion of the first installation. By the tests it was conclusively proved that on the ore to be treated, which is a



The Nissen Stamp.

quartzite of medium hardness, the Nissen stamp has a capacity of 10.75 tons per 24 hr. through a 28-mesh screen. The daily capacity of the finished plant may therefore be estimated at 4,000 tons, which will be much in excess of the capacity of any existing stamp-mill. The gravity tests were conducted with the greatest fairness. Complete mills, including besides the Nissen stamp, ordinary five-stamp batteries, rolls, and circular mills of various kinds, were run on the same ore, so that there could be no error in comparing results under different conditions. Mr. Bettle's problem was to reduce to 28-mesh ores averaging 1.5% copper and to get the best possible product for concentration at the least possible cost. Without wishing to go into comparisons, I may say that the fact, as demonstrated during the test, that the Nissen stamp made 10% less slime than any other competing mill, had much weight in the final choice.

In the Nissen stamp there have been retained the well-tried principles of the gravity stamp, the new features being particularly in the use of a circular independent mortar to increase the discharge of the stamp, thereby increasing its capacity as much as 10% in proportion to the horsepower required for its operation. The cross-section of our mortar is similar to that of the ordinary mortar, and the screen is relatively the same distance from the stamp in its horizontal points. Owing to the fact that the area is so great and also that the screen is in a position to receive the impact of the pulp against it at right angles always, a uniform crushing is accomplished without excess wear on the screens. The mortar is effectually protected from wear by a lining that is cast in one piece and held in such a manner that it causes no trouble by working loose. The feeder is of the improved Challenge type, designed to work easily, so that constant attention is not required to keep the nuts and pins from becoming loose; also by feeding the stamp independently, steady and regular operation is insured, so that the shoe and die wear much more evenly than in other types of mortars, and allow closer feed. As to material used, the cam-shafts and stems are of hammered steel, the shoes and dies are of a special mixture or hard metal; the cams and tappets are of cast steel. A cam-shaft bearing is placed on each side of every cam, which goes far to do away with the danger of breakage.

Briefly, the advantages of this type of stamp lie in the ready and positive discharge—owing to the increased screen surface, every part of which is at right angles to the splash; in the avoidance of slime, because, for the reasons above cited, there is less re-grinding, and economy in power—chiefly for the same reasons. The effort has been made to relieve the mill promptly and as thoroughly as possible of pulp fine enough to pass the screen; and although in the course of ten years' experiment certain minor advantages have been developed, the feature mentioned is the main issue, and to it the success of this type of mill is due.

In operation, the Nissen stamp-mill is similar to the ordinary five-stamp battery, save that each stamp is independent and larger, weighing 1,500 lb. and the shoe is of 10-in. diameter; there is an independent mortar for each stamp, and the screens are semi-circular for each unit. From one to six stamps may be operated on the same cam-shaft, and any stamp in the battery may be hung up for any purpose without interfering with the continued operation of the other stamps.

In 1905, Fairbanks, Morse & Co. entered into an arrangement whereby they became the sole manufacturers and selling agents, controlling our patents. They have sold several plants of good capacity since the first of the year, and are now about to install plants in Idaho, Oregon, and Montana, besides several in Mexico, the Southwest and the great plant at Garfield.

Publications Received.

Bulletin No. 291, of the United States Geological Survey, A Gazetteer of Colorado, and the Redding, Cal., quadrangle Folio 138 of the Geologic Atlas of the United States.

The Twenty-Fourth Annual Coal Report of the Illinois Bureau of Labor Statistics for 1905. Including the Seventh Annual Report of the Illinois free-employment offices.

The production of quartz and feldspar, slate, phosphate rock, magnesite, carbon dioxide and of salt, in the United States during the year 1905, being advance sheets of the 'United States Mineral Resources,' by the Geological Survey.

The Denver, Northwestern & Pacific railway has issued a pamphlet descriptive of the oilfields through which that new road passes, which cannot fail to interest oilmen. It describes the geology of the region and gives results obtained at several wells together with analysis of the oil.

Commercial Paragraphs.

GEORGE W. PRICE & CO. is now at the old place, 25-31 Jessie St., San Francisco, with a large shop and good facilities for handling pumps, gasoline engines and fittings.

THE PELTON WATER WHEEL CO. is temporarily at 517 Market St., San Francisco, but expects to be permanently situated in the Monadnock Bdg., San Francisco, by August 15.

THE BUFFALO FORGE CO., of Buffalo, New York, has installed a large irrigation plant on the McBryde plantation, on the island of Kauai, one of the Hawaiian group, where the plant is in successful operation.

ALLIS-CHALMERS CO., of Milwaukee, reports the following recent sales: Boston & Montana C. & S. M. Co., two 32 by 72 in. hoisting engines; Ansonia Brass & Copper Co., Ansonia, Conn., 19 and 38 in. by 42 in. Reynolds combined horizontal and vertical engine; Bullychoop Gold Mining Co., Trinity county, Cal., complete hydraulic electric transmission and mining equipment, including 20-stamp mill, motors, a 450 kw. generator, direct connected to water wheels, and a transmission line 3½ miles long; Camp Bird, Ltd., Ouray, Colo., thirty 6-ft. Frue vanning machines, stamp-mill machinery, etc. Wheeling Milling Co., Mine La Motte Station, Mo., 25 ft. Hancock jig. St. Joseph Lead Co., Bonne Terre, Mo., standard 25 ft. Hancock jig.

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Editorial.

THERE IS to be an International Mining Exposition at New York in 1908. Already a company has been organized at 564 Monadnock Bdg., Chicago, to further the interests involved. It is the intention to have a grand exhibit of mining machinery and to utilize the occasion for a meeting between all those who are connected with the mining industry of this and other countries.

SPECULATIONS concerning the locality of the next mining excitement in Colorado lately occupied the attention of our friends at Denver, and now we read that Mr. S. F. Emmons has suggested the White River plateau and the North Park, on the western slope of the Front range. Why not? This is an area of granite traversed by late eruptives and suggests geological conditions known to be favorable elsewhere, as at Butte.

WE PUBLISH a description of a smelter employing the Pohlé-Croasdale process, which has been undergoing trial for several years, with varying results. In brief, this process consists in crushing ore to 20 mesh by methods commonly employed in dry-crushing plants, mixing the crushed ore intimately with salt, and subjecting it to a chloridizing roast in an oxidizing atmosphere of 1,000° C. The volatilized metals—gold, silver, copper, and lead—are cooled in sheet-metal flues and the condensed fume is caught in a bag-house and subjected to further treatment for the recovery of the metals named. The metallurgical world will wait with interest to learn how successful the process proves in its commercial application.

THAT STRIKING PERSONALITY who combines the attributes of St. George and St. Vitus has thrown his spell over the country and asks everyone to endorse the funetic methods of Brander Mathuse and Andru Carnaygy. It revives memories fo the 'Bad Boy's Diary' and of the sad efforts for which we were punished in early youth. The President's notions on phonetic spelling are interesting, everything he does is calculated to add to the gaiety of nations, but he takes himself too seriously sometimes, as in this matter of making a violent change in our orthography. Changes must come, but by evolution, not revolution; they will come in due course of literary development, not by the ukase of any individual, however distinguished. Language is only mutilated by such surgical operations which, after all, are not final, although "perfectly successful" from the perpetrator's point of view. The letters of the English language, unlike the Latin, have no fixed sound. Phonetic to one is funetic to another.

THE LADIES of Nevada do credit to the sagebrush State. We referred lately to the lady prospector, but we find that she is not singular, but plural. There are several of

them. It is announced in a special dispatch that another lady has been finding gold ore; this one is an expert, for she graduated from a miners' boarding house. Her vigor does credit to the cooking, for on May 23 she staked claims covering altogether a thousand acres, and thereby located an old lake, the dry bed of which consisted of gold-bearing sand. Not to be outdone, two other ladies fluttered location notices over the desert until they had 10,000 acres to their credit. They do things on a large scale in Nevada, where the horizon is so far away and the distance so magnificent.

DURING THE past week a number of Italian and Slav miners went on strike at the Kennedy mine, in Amador county, California, in order to compel the management to use safety clutches on the skips. A minority of the men refused to join the foreigners in their protest, not for lack of sympathy in the purpose of the strike, but because they could not endorse the action of men who did not belong to their union—the action was 'irregular' because it had not been authorized by the union. It appears that there is a law requiring the use of safety clutches, but there is no specific penalty to compel its enforcement, so that a company is only placed on the defensive should an accident occur and is then liable for damages. But there is a touch of humor in the other feature of the incident, namely, that a protest looking to safety of life is to go unhonored unless it be endorsed by the union.

Black Sand.

The daily newspapers have published several sensational accounts concerning thousands of acres of placer ground in different parts of the country which have been rendered of phenomenal value by reason of the alleged discovery of Dr. David T. Day, that the gravel contains large amounts of gold. It is said that samples sent to him at Washington or Portland have assayed thousands of dollars per ton, and so forth. Now, while we would not belittle any effort of the Geological Survey to aid the miners in making the most of our mineral resources, we are beginning to believe that Dr. Day's researches into black sand are affording more ammunition to irresponsible promoters and to a sensational press than they are actually improving the treatment of a material, the existence of which was known long before the much-advertised experiments were made. However well-intentioned, this work of one of the most active officers of the Survey is being ridiculed, not undeservedly. Here is a telegram from Cheyenne saying that his assay "shows that the dirt runs $7,800 to a ton in gold, 30 per cent magnetic iron, 54 per cent hematite, making these claims the richest placers in the world." At the same time we read in one of the leading papers of Australia that "Dr. David T. Day, an American Government expert, has created a new industry in the northwest of the United States. After months of patient investigation, he has proved that the common black sands of the Pacific coast are rich in useful minerals, and that good steel can be made from this sand." This is the sort of stuff that is appearing periodically; it puts the Survey in an absurd light. Not long ago some one discovered that clay contains aluminum and then proceeded to form a company to smelt that metal from a common mineral; indeed, Dr. Day's black sand reminds one of the story of old Governor Gilpin, of Colorado, who took Professor N. P. Hill into the San Luis valley and there expatiated to him on its possibilities as a great wine-producing region, ending up with an index finger that pointed to the glistening quartz sand at the foot of the Sangre de Cristo range; "And there, Professor, is the silica from which the bottles will be made."

A Few Inaccuracies.

The 'market letters' of stockbrokers often belong to the humorous part of current literature; they illustrate what is termed the pathetic fallacy, in its most aggravated form. Here is a sentence from the epistle of a man at St. Louis. "The fissure is 150 ft. wide, and we see no reason on earth, with the rapidly widening orebody as shown by this winze, why the ore should not become as wide in depth. There is nothing in Nature to prevent it and it is good sound reasoning to expect it. These orebodies were formed by the mineral-bearing solutions coming from depth, and isn't it reasonable to assume that the nearer you get to the source the greater will be the width in orebodies of this character. We believe we have a deep mine because it is a fissure vein. It is an orebody formed in the fissure of the earth's surface. Deep mines are what pay. Look at that great mine in Cornwall, England, 9,000 ft. deep, mining the ore from under the sea and a dividend payer for four hundred years." Here is our old friend the 'fissure vein' masquerading as an assured source of wealth and here is geology in the guise of blatherumskite. It is not too much to say that every statement in this extract is untrue. Mineral solutions do, for the most part, ascend from below; nevertheless, it is not the mineral solution, but the precipitation in concentrated form of the metals that it carries, which forms the orebody valuable to man. Mineral solutions come from the deep, true enough, but their work of deposition is done chiefly in the approach to surface, at least much nearer to grass-roots than to the centre of the earth. If lodes did become richer in depth we should see shafts sunk right down to the heart of creation, instead of fooling on top. Yes, you can have a deep mine if you follow a fissure vein, but you do not necessarily have a rich one either because it is deep or on a 'true fissure.' Some deep mines pay handsomely, but they are less numerous than the shallow ones that also pay satisfactorily. There is no mine in Cornwall, or anywhere else, that is 9,000 ft. deep; the deepest is the Tamarack No. 3 shaft in Michigan, which has been sunk to 5,128 ft. The longest incline-shaft is No. 4 Calumet, of the Calumet & Hecla, which is 8,100 ft. long and nearly 5,000 ft. deep. The tin mine under the sea is Botallack, now idle for many years, because the lode became poor. The deepest mine in Cornwall is Dolcoath, where work is proceeding at 3,000 ft. As shareholders unfortunately read the literature of the bucket-shop more than that of the technical periodical, we hope the gentleman at St. Louis will be more careful next time.

By the Way.

In a recent address before the American Association for the Advancement of Science, Mr. Wm. H. Burr, professor of civil engineering in Columbia University, described the work on the Panama canal. As reported in *Science*, he said:

The length of the Panama canal is about 45 miles between 40-ft. contours at low water at its termini, but the length between shore lines will be not more than 42 miles.

The topography of the isthmus at the Panama crossing is well adapted to the construction of this ship canal, the original summit of the divide on the line of the canal being but about 330 ft. above sea-level. This has now been reduced to about 170 ft. above mean sea-level by the French excavation at Culebra. About one-half of the length of the canal lies along low marshy ground on either side of the isthmus, making two natural sea-level sections, one about eighteen miles long on the northerly side of the isthmus, and the other about seven miles long on the southerly side; that on the northerly side running for the greater part of its length generally along the course of the Chagres river. This river has been one of the main features in the consideration of the canal work since the beginning of operations by the old Panama Canal Co. in 1881. It is not a large river, as it has not more than about 800 square miles of watershed above Bohio, where in its flow toward the sea it leaves the rising ground and enters what may be termed the coastal plain, through which it meanders along a sinuous course to the ocean. It has even changed its course in the past at various locations in this marshy ground.

That portion of the canal route lying in the higher ground of the divide is but about 24 miles long, and but little more than three-quarters of a mile of it had an original surface elevation exceeding 200 ft. The surface material is largely clay of ordinary character, slippery and easily moved when wet, but holding well in place when protected from the entrance of water. Below this covering of clay lies material of irregular character, as the entire isthmus is of volcanic origin. In the continental divide, at a depth varying from 20 to 40 or 50 ft. below the surface, an indurated clay, classed for purposes of excavation as soft rock, is found. This material gives place irregularly to hard rock at greater depths. Much of the rock of the isthmus is soft, although there is hard basalt in a number of places and, in one locality on the Panama slope of the divide, columnar basalt is found.

The work performed by the old and new Panama canal companies amounted in the aggregate to not far from eighty million cubic yards of all classes of excavation, of which possibly forty million cubic yards at most will be found available for the American construction of the canal, whether a lock plan or a sea-level plan be adopted. This work extends practically over the entire canal route, with the exception of the approach channels in the two terminal harbors, and it is nearly continuous. Over considerable stretches of the higher ground it is little more than shallow cuts through the softer surface materials, but at the great Culebra cut the material which has been excavated varies from the surface clay, readily removed by steam-shovels, to hard basaltic rock, requiring blasting by high explosives before it can be removed. All the material, even the indurated clay, below the softer covering, requires blasting before it can be excavated, although the softer portions need the action of black powder only.

Except the deep cutting at Culebra, through the summit of the continental divide, the most marked work done by the old French company was the dredging through the low marshy lands from Colon to Bohio. There is at present a strip of partially completed canal about 14 miles long with a bottom width of 72 ft., which may be navigated by vessels drawing 12 to 14 ft., with the exception of a short distance near Colon. Indeed, so much excavation was completed in this portion of the canal, intersecting the Chagres at a number of places, that the waters of that river have abandoned the old bed and now flow through the partially completed canal prism.

Depression in Consols.—In explaining the recent sharp break in British consuls to the lowest level for the year, *The Times* says:

Motor-cars and the consequent fur coats, the ever-growing costliness of feminine decoration, and the modern habit of dining, uncomfortably and on preposterous terms, at hotels, while the relentless chancellor snips, with his 'abhorred shears,' a shilling out of every pound that we receive—these are a few of the influences which have led investors to forsake the arid austerity of the consols market and to look for a security which will pay them something. At the psychological moment came the Japanese loans, providing a comfortable yield and, for some time, advancing premiums and improvement in capital value. The public learned its lesson readily, and has substituted for the old-time thrift, that used to lay up treasure and invest it, a habit of turning out its tin boxes, realizing its gilt-edged securities, and re-investing in stocks with a higher yield.

There is economic authority for a theory that the price of capital is likely, on the whole, to tend upward in future, from which, if true, it will follow, as a corollary, that the prices of gilt-edged and other securities will tend downward. Economic authority is rather at a discount at present, having lost its edge in the clash of partisan political warfare, but this theory is a fascinating theme, and may well be pondered by those who question the advisability of writing down their securities. Recent experience has been against it, for in spite of the movements of the last few years capital has certainly grown cheaper and more abundant in the last half-century. On the other hand, the organization of industry on the modern scale and the development of the use of machinery and mechanical appliances, cause an ever-growing demand for capital, which has at present outstripped the supply, and may easily justify the economic theorist by continuing to do so. Moreover, it must not be forgotten that the last few years have witnessed the destruction of capital on an enormous scale. The South African war and the Russo-Japanese war are sufficient instances.

When we remember that trade is active nearly all over the world, and also the vast amount of development work that is being done in the comparatively backward countries, we have hit upon another very important reason for depression in gilt-edged securities. The program of railway construction in Canada is a case in point, and almost every report issued by the great South American railways contains the announcement of the proposed issue of a million or two of capital. As for the United States, there is not only remarkable industrial development, and enormous expenditure of capital by railroads and other corporations, but there is also a huge fabric of speculation which has to be financed somehow, and it is at present being to a great extent financed in London and on the Continent. Borrowers complain that the spring of capital in London has dried up; perhaps it is truer to say that it has been connected with New York by hidden pipe-lines, and so has little supply to send down the old taps. It has been calculated that New York at present owes some eighty millions sterling on bills, 'kites' and stocks on this side of the water. This development has undoubtedly affected the supply of money here, and so the price of securities.

Special Correspondence.

Butte, Montana.

Another Company Formed to Develop Old Mine. Important Discovery in the Rarus. Encouraging Prospects on the East Side.

Another large mining company has been organized under the laws of Maine, and is called the Butte Central and Boston Copper Co. The main property of the company is the Ophir mine, in the southern part of the city, with a shaft 525 ft. deep. The company is cutting a station at the 500-ft. level, and will install machinery to sink to 2,000 ft. The old mine has yielded a fair amount of ore and is now being worked in the upper levels, producing 100 tons daily. It carries enough silver and gold to make a paying proposition. Among the promoters are Freeman I. Davison and Robert G. McMeekin, of Boston, and Samuel Hill, of Butte. Other directors are Sir Frederick W. Borden, of Ottawa, Canada; F. Orr Lewis, of Montreal; J. F. Tufts, of Wolfville, Nova Scotia; Morgan Strong and Alexander Robertson, of New York; Lee Mantle, E. G. Blackburn and J. H. Leyson, of Butte, and B. F. White, of Dillon, Montana. The capitalization is $15,000,000. The company claims to have $1,750,000 in the treasury, of which it will use about half to get full title to the properties. The Ophir has been worked by several companies in the past and was a paying proposition until silver dropped. The present company is the holding corporation for the stock of the Butte Central Copper Co., organized last spring, which has sunk the shaft nearly 200 ft. this summer. The veins in the vicinity are large, and there is a good body of ore in sight. The object of sinking the deep shaft is to ascertain whether copper ore can be found in the southwest part of the city, as well as on the hill. The company claims to have found a new cross-vein that contains ore high in gold and silver.

The Mountain View mine of the Boston & Montana Co. has opened its main shaft again, the timbering being fully replaced. The operation took nearly six weeks. In the meantime nearly 900 tons per day were hoisted through an air-shaft, and it is expected that the main shaft will soon be hoisting 1,200 tons per day. There are said to be nearly 1,000,000 tons in sight in the mine. The shaft was not only re-timbered for 900 ft., but was equipped with automatic skips, which will expedite the handling of ore. The Manhattan Con. mine of the Anaconda Co. has been shut down for repairs to the shaft. The engine-frame broke early in the week, and as it became necessary to close down for a few days on this account, it was thought well to begin re-timbering, which was much needed. It will take a month or more to finish it. At the same time the Clear Grit mine is, for the most part, closed down, as the ore from that claim was hoisted through the Mountain Con. shaft. The Mountain Con. ordinarily yields about 500 tons of ore per day and the Clear Grit about 50 tons. The output of some of the other mines of the company will be increased, if possible, until the repair of the shaft is finished.

The discovery in the Rarus mine of the Red Metal Co. is being explored. The cross-cut proves the orebody to be nearly 30 ft. thick, but drifting and raising have not yet progressed far enough to prove the full extent of it.—The East Butte Co. has struck a small vein of high-grade ore in the shaft of its Dutton mine, at a depth of about 200 ft. Sinking continues in the several shafts, all the work at present being exploration and development.

The development which has been in progress near the ridge east of the city has developed a number of small strikes of ore, some of which are being worked by tributors, as is the Bertha, on ground belonging to the Bullwhacker Co. In the Bullwhacker shaft ore was found averaging 4% copper and carrying some silver. Similar bodies had been struck, on what is probably the same vein, in the Maggie and Bertha, and this week in the Montgomery, under bond to the Lewissohns. The Bullwhacker shaft will soon be down to the 400-ft. level, when a cross-cut will be started to determine the character of mineralization below the water-level. It is expected that copper sulphide will be found, as was the case with the mines of the Amalgamated and Heinze, and with the Pittsmont, which lies nearer these new mines. The vein is nearly 100 ft. wide on the surface near the Bullwhacker, and the country near there is traversed by other large veins. If the results are as expected it will add at least one-half to the present copper-producing area about Butte.——G. C. Hopkins, purchasing agent for the Pittsburg & Montana Co., is the purchaser named in a deed of the Lillie claim, near Park cañon, not far from the claims just mentioned. The purchase price was $125,000. It is supposed that the claim was bought for some unnamed party, probably the company, but the real purchaser has not been divulged. The Pittsmont mine, belonging to the same company, is being rapidly developed and the orebodies explored, but little information is given out concerning it.

The East Butte Extension Co. has declared a 1% dividend, payable October 1. This represents more than 1% to the investors, as most of the stock was sold at 50c., par being $1. The company owns several claims near the Belmont and J. I. C. of the Anaconda, and has four shafts sinking. It is hoisting 40 tons of ore per day from its main shaft, besides the sinking. F. H. Cooney, the manager, claims that it will soon be hoisting 100 tons per day. New ore-bins are being built. The chief claim is the Westlake, on which the company has two shafts.

The Great Falls smelter, of the Boston & Montana Co., the capacity of which is to be increased one-third, is now receiving 4,000 tons daily, of which about 3,000 is second-class ore. The increased output of the Mountain View mine will tax its capacity to the utmost. There is great difficulty in planning for increased capacity, as the power is limited and former additions to the plant have left it in such shape that it will have to be largely re-modeled. A new stack will probably be necessary, as well as new furnaces and buildings. But the main difficulty will be in securing an increase of power. At present 3,000 h.p. is now being developed by steam to augment the water-power, and the decrease in water in the Missouri river will make still more steam power necessary later in the season. It is thought that the company intends to devise some plan by which power from the lower falls can be utilized. There is a greater fall than where the smelter now is, and it may be considered advisable to build a large power plant there.

Spokane, Washington.

The Annual Report of the Bunker Hill & Sullivan in the Coeur d'Alene. Splendid Production at Low Costs.

The annual report of the manager of the Bunker Hill & Sullivan mine in the Cœur d'Alene district of Idaho, for the fiscal year ending May 31, 1906, has just been made public. It is chiefly interesting for the reason that the Bunker Hill & Sullivan mine is the most productive of its kind in America and is second only to the Broken Hill Proprietary mine, in New South Wales, as a producer of lead and silver. Among notable statements found in the report are the following: The Kellogg shaft was sunk 580 ft. on the incline below the Kellogg tunnel, at a cost of $38.68 per ft. The shaft has two hoisting compartments, each 5 by 5 ft., and a pump and manway compartment. Experiments have been conducted during the year to determine the most ad-

vantageous method of re-working the mill tailing, which has accumulated to the amount of 2,000,000 tons, and a satisfactory system has been arrived at which permits a profit at even lower prices for the metals than are now obtained. During the year 308,800 tons of concentrating ore were stoped at a cost of $368,490, or $1.252 per ton, divided principally as follows:

Detail of Labor and Supplies.	Total for Year.	Average per Ton for Year.
Foremen, bosses, blacksmiths, machinists, tool-packers, etc	$ 41,010.01	$0.133
Timbermen and carpenters	14,467.64	0.041
Miners	105,270.42	0.346
Carmen	8,178.20	0.027
Shovelers	112,902.57	0.366
Power labor	4,929.70	0.016
Repair labor	6,371.20	0.021
Explosives	20,145.30	0.065
Illuminants	6,677.66	0.022
Lubricants	850.84	0.003
Iron and steel	3,102.30	0.010
Miscellaneous supplies	8,144.00	0.026
Timber and lagging	43,083.05	0.139
Power supplies	3,038.40	0.010
Wood	4,453.90	0.015
Stable and stock	920.00	0.003
Exploration charged off to stoping, 484 ft. of drifts, raises, etc	2,625.39	0.009
Total	$386,490.58	$1.252

The mine also produced 38,550 tons of shipping ore, at a cost of $60,228.37, as follows:

Details of Labor and Supplies.	Total for Year.	Average per Ton for Year.
Foremen, bosses, blacksmiths, machinists, tool-packers, etc	$7,058.82	$0.183
Timbermen and carpenters	2,876.11	0.075
Miners	14,469.93	0.375
Carmen	1,033.05	0.027
Shovelers	19,649.15	0.510
Power labor	585.40	0.015
Repair labor	980.30	0.025
Explosives	2,801.25	0.073
Illuminants	959.46	0.026
Lubricants	66.80	0.002
Iron and steel	437.10	0.012
Miscellaneous supplies	1,223.35	0.032
Timber and lagging	7,185.20	0.184
Power supplies	353.25	0.009
Wood	549.20	0.014
Total	$60,228.37	$1.562

Making the total ore mined 347,350 tons, at a total cost per ton of $1.296.

Tramming was mostly accomplished by means of an electrically operated railroad, which handled all of the above-mentioned tonnage of ore at a cost of $0.059 per ton. In addition to the ore 507 tons of waste rock were hauled, and timber, lagging, and other supplies were hauled into the mine, which is included in the cost, together with hauling men to and from their work in portions of the mine.

During the year 308,750 tons of ore were concentrated, making the average work of the concentrator 846 tons per day, or say 895 tons per 24 hours of acutal operation.

The cost of concentration was $64,270.25, as follows:

Details of Labor and Supplies.	Total for Year.	Average per Ton for Year.
General Labor	$ 7,110.85	$0.023
Millmen	21,916.75	0.072
Laborers	1,754.25	0.006
Power labor	1,322.17	0.004
Crusher labor	2,540.65	0.008
Repair labor	3,572.06	0.011
Illuminants	928.00	0.003
Lubricants	1,000.10	0.004
Iron and steel	752.99	0.002
Miscellaneous supplies	12,351.43	0.040
Lumber	1,220.00	0.004
Roll shells	1,525.00	0.005
Trommel screens	1,226.00	0.004
Crusher supplies	1,980.00	0.007
Wood	2,575.00	0.008
Power	2,495.00	0.008
Total	$64,270.25	$0.209

The gross income of the mine was $4,816,677, of which 43.1% was available for dividends. There are ore reserves, available on May 31, amounting to 1,671,953 tons. The gross assay-value of the ore and concentrate sold was $4,705,543, from 347,350 tons of ore mined, of which 308,750 tons were concentrated, yielding 46,616 tons concentrate and 4,949 tons slime. In addition, 38,580 tons of ore were shipped direct to the smelters. The total production was 97,566,290 lb. lead and 2,099,084 oz. silver.

The Bunker Hill & Sullivan mine paid its 107th dividend on August 6, the total to date being $6,966,000.

Calumet, Michigan.

Activity in the Lake Superior Copper Mines. The Keweenaw Co. The Hancock Consolidated. Prospecting at the Caldwell. Other news.

At a meeting of the board of directors of the Keweenaw Copper Co., this week, the reports of development work accomplished were received and discussed. All the directors were present with the exception of Spencer R. Hill, of New York. The directors, including C. A. Wright of Hancock, Capt. James Hoatson of Calumet, Thomas F. Cole, of Duluth and John D. Ryan, of Butte, went from Calumet to the company's mines in Keweenaw county. Capt. Thomas Hoatson, mining director, and C. A. Wright, Jr., secretary and treasurer, who is in charge of the New York office, also visited the properties. Reports from the development on its Medora property, where a new shaft is being sunk in the Medora lode, continue to be encouraging. The construction of the Keweenaw Central Railroad is progressing rapidly and the contractors expect to have the grading finished to Calumet by next January. Men are now engaged in laying rails near the Delaware mine.

The presence of Messrs. Cole and Ryan in the copper country this week led to the report that important plans regarding the future work of the Hancock Consolidated Mining Co. were being discussed. Cole and Ryan, together with the St. Mary's Mineral Land Co., of Boston, own 60,000 of the 100,000 shares issued by the Hancock Co. Capt. James Hoatson, of Calumet, and John D. Cuddihy, of this city, also are in the district, so that a quorum of the board of directors is available. The Hancock is progressing steadily with the unwatering of its 1,000-ft. shaft on the Hancock lode. The water has been lowered to the second level and as soon as the workings are entirely cleared men will be put in the shaft and development started. The site of the proposed vertical shaft, which will tap the Pewabic lode, from which the Quincy mine has paid $16,000,000 in dividends, has not yet been selected. The vertical shaft will also tap the Hancock and other lodes traversing the lands of the Hancock Consolidated Company.

Explorations on the Caldwell Copper Co.'s property south of the Tecumseh is under way, a diamond-drill being in use. The Caldwell is controlled by the Calumet & Hecla Mining Co. At a recent meeting of the directors the following officers were elected: President R. R. Goodell; vice-president, R. Skiff Sheldon; secretary and treasurer, Courtney C. Douglas, and the foregoing, together with P. W. Nichols and Allan Rees, directors. All of these are Houghton men. The Caldwell property comprises 560 acres lying between the Tecumseh and Rhode Island. The company has an authorized capital of $2,500,000. A little less than 50% of the capital stock was issued to the original landowners in exchange for the property, and the Calumet & Hecla took slightly less than 50%, paying cash therefor. The remainder of the capital stock, which is held in the treasury, is under option to the Calumet & Hecla, which, if purchased by the latter, will give the Calumet & Hecla Co. control.

Capt. James Hoatson, of Calumet, has been elected president of the newly organized Cananea Central Copper Co. C. A. Duncan, of Duluth, is vice-president and treasurer, and F. R. Kennedy, secretary. These men hold the same offices with the North Butte Mining Co., and the general and executive offices of the Cananea Central Co. will be with those of the North Butte Co., at Duluth. Capt. Hoatson, beside being president of the Cananea Central and North Butte Co., is vice-president of the Calumet & Arizona and Superior & Pittsburg, and a director of the Butte Coalition, Hancock Consolidated and Keweenaw Copper companies.

Arrangements are being made by the Michigan Mining Co. for the construction of a railroad spur to its C shaft. It will be extended from the main line by the Mineral Range Railroad. Plans are being made for the construction of a shaft and rock-house at C shaft at an early date. It will be similar to those that will be built at the Centennial and Franklin Junior mines, being of the circular type. C shaft is being sunk in the Calico lode, and from that formation cross-cuts are driven to reach the Branch vein and to investigate the Minnesota conglomerate. The Michigan is opening its most promising ground in the drifts eastward from shaft B and extending toward C shaft. The latter is now equipped with temporary hoisting facilities, there being no need of larger machinery at present.

The Mass Consolidated Mining Co. has started a new shaft on its property. It is known as D shaft and is situated 1,400 ft. south of C shaft. The latter is opening promising ground in the direction of the new shaft and therefore the outlook for D is considered encouraging. It is sinking on the Knowlton lode. At C shaft the results are good. Ore shipments average 350 tons daily. After September 1, when the Michigan releases one head in the Mass mill, the Mass Consolidated Co. will double its production. The mine is now shipping approximately 500 tons of ore daily, and with the output and earnings doubled, the stockholders ought to receive tangible benefit.

Salt Lake City, Utah.

Progress at Bingham. Sale of Alta-Quincy Mine. Demurrage on Cars of Ore. Developments in Sierra Madre District.

The ore and bullion settlements last week amounted to $550,200, and during the same period 221,399 shares of stock were sold on the Salt Lake Stock & Mining Exchange for $188,712. The management of the Ohio Copper Co., at Bingham, has about completed arrangements to begin sinking a working shaft, which is to be equipped with a hoisting plant capable of going to a depth of 2,500 ft. During the present week shareholders will meet to discuss the matter of limiting the company's indebtedness to $650,000 and re-incorporating under the laws of some other State than Nebraska.——Owing to the delay in shipment of equipment, the Utah Copper Co. has been unable to get its second steam-shovel working in the removal of overburden from its Bingham property.——The Gold Development Co. has resumed development at its properties near Marysvale, which have been idle for several months. M. F. Murray, of Richfield, is manager.——The sale of the Alta-Quincy mine, at Alta, has been consummated, the purchaser being Tony Jacobson, manager of the Columbus Consolidated Co., operating in the same camp. Considerable low-grade ore has been developed in the mine.——The mill of the Columbus Consolidated Mining Co., at Alta, is now operating with two 10-hour shifts, and turning out a car of concentrate daily. There is a possibility of a consolidation of the Odin, California, and Comstock mines, at Park City, being effected. Negotiations have been pending for some time.——Davis Calyx drills are being used to develop the West Quincy mine, at Park City; the machines have been installed on the 400-ft. level. The main working shaft, double-compartment, at the Silver King Consolidated mine, at Park City, has reached the depth of 1,100 ft., and the management reports a change in the bottom which indicates the proximity of an orebody.

The new Garfield smelter is getting well under headway and it is a matter of only a short time until the entire plant will be in operation. Four MacDougal furnaces are now working and the convertors were started up a few days ago. The plant will handle about 1,200 tons of ore daily when in full blast.

Articles of incorporation of the Nevada Douglas Copper Co. will be filed in this State during the present week to operate the Douglas mine, at Yerington, Nevada, which recently changed hands, the same having been purchased by a Salt Lake and Boston syndicate. The capital stock will be $5,000,000. The officers will be: President, J. D. Wood; vice president, Frank J. Hagenbarth; secretary and manager, Walter C. Orem, of Salt Lake, who, with W. V. Rice of Salt Lake, A. L. Pearse of London, E. R. Hastings and A. J. Orem of Boston, are members of the board of directors.

The Utah Car Service Association, of which all transportation lines operating within the State of Utah are members, attempted to introduce new demurrage rules, effective on the 28th inst. It was proposed to allow the samplers and smelters only two days' free time for the unloading of cars of ore. The circular announcing this change was met with such a strenuous protest from the sampling and smelting companies, as well as from the producers, that the Car Service Association consented to a modification of the rule. But as it stands, three days is the maximum that a car can be held after receipt without being subject to demurrage charges of $1 per day. Under former regulations, the samplers were allowed four and the smelters five days free time.

A large body of milling ore has been opened on the 800-ft. level of the Cyclone mine at Stockton. It has been exposed by a cross-cut for 11 ft. The shaft at the Eagle & Blue Bell mine, in the Tintic district, has reached the depth of 1,100 ft. and a station is being cut. A cross-cut will be run to cut the orebody opened on the 1,000-ft. level. Excellent headway is being made with the construction of the new plant of the Utah Smelting Co. near Ogden. The management is in the market for ore and has closed several good contracts with Utah and Nevada mining concerns.

Unusual activity is being displayed in the Sierra Madre mining district, north of Ogden. Recent developments indicate that it will become a good copper camp as well as a producer of lead-silver ore. The management of the Majestic Copper Co. has an opportunity to dispose of its lead smelter at Milford to mine-owners at Good Springs, Nevada, who have opened negotiations for it.——The Skylark Copper Co.'s property, in Beaver county, has been undergoing examination, in the interest of Eastern people.——Copper ore has been struck in the Black Rock mine, in Beaver county, the shaft cutting a 4-ft. vein at 165 ft. depth.

The management of the Bingham & New Haven mine, at Bingham, has announced an initial dividend of 10c. per share on the issued stock, amounting to $22,600. The company will probably make quarterly distributions hereafter.

Toronto, Canada.

Quartz Mining in the Yukon. Fresh Activity in the Manitou District. News From Cobalt. The Gillies Timber Limit.

The Department of the Interior at Ottawa has received from Mr. Snyder, superintendent of the mounted police at White Horse, Yukon Territory, a report to the effect that quartz mining is experiencing a great boom. Numerous discoveries have been made in the Watson and Wheaton River districts, at points from 15 to 25 miles southwest of Robinson Siding, on the White Horse Pass & Yukon Railway. Samples of rich ore are claimed to run from $200 to $600 per ton. Claims are being purchased as soon as staked, prices ranging from $250 upward. Applications have been made for two townsites, one at the mines and one at Robinson Siding, the nearest

point on the railway. In the neighborhood of Conrad work is being done on about 40 claims, giving employment to some 400 men. The Conrad Con. Co., employing over 200 hands, was to begin shipping to the southern smelters in August. At the Pueblo copper property, five miles from White Horse, extensive operations are being carried on, and it is expected that fully 1,000 tons of ore will be shipped this fall. The various placer fields in the district are yielding well, 1,025 oz. gold being brought from Livingstone creek in one week.

There is a marked revival of activity in gold mining in the Lake Manitou district and neighborhood, largely owing to the introduction of American capital. Anthony Blum, owner of the Laurentian mine near Crystal lake, has decided to handle it as a free-milling proposition. In addition to quantities of free-milling ore, there are deposits of pyrite which are being explored. Chalcopyrite has also been found studded with gold, which in some samples makes up half the weight. Considerable development work has been done during the last few months. The shaft has been carried down 270 ft., a tank cut at the 200-ft. level and a skip put in. Cross-cuts 230 ft. long at this level have tapped rich orebodies. A 20-stamp mill is at work on the ore removed in development. A pipeline brings water from Crystal lake, and a telephone line to the neighboring town of Dinorwic is being constructed. The locations of the Glass Reef Mining Co. on Lower Manitou lake, where work was suspended in December, 1900, are being examined by Edwin H. James, secretary of the company, with a view to the resumption of operations. Buffalo capitalists are investigating conditions on the Pritchard property, near the Redeemer mine, where a test shaft was sunk some years ago, samples from which were said to run from $12 to $40 per ton. Walpole Roland is engaged in making tests on behalf of the prospective purchasers. E. H. Page, of Minneapolis, is developing the Page-Holmes property on Contract bay on behalf of several St. Paul investors, and has secured samples of rock containing free gold from a rich 4-ft. vein, which widens as it is followed, and is intersected by a larger one.

The Ontario Government has a force of 30 men employed on the exploration of the Gillies timber limit, near Cobalt, under direction of Prof. Willet G. Miller. A 75-ft. shaft is to be sunk for the development of the silver-ore deposit recently discovered. A rich find of antimonide of silver has been made on the Kerr Lake Mining Co.'s location, otherwise known as the Jacobs property, in the Cobalt area. It is reported that free-milling gold assaying $1,827 per ton has been found on a location in the southern part of the Cobalt camp. A 6-in. vein, struck at a depth of 12 ft., has been exposed for 250 ft., and work is being prosecuted day and night. McKenzie & Philbrick, in sinking a shaft on their claim on Trout lake, in the Temagami forest reserve, struck a vein of niccolite at 54 ft., which assayed $1,100 per ton. A drift on the vein exposed a shoot of pure native silver.

Cecil B. Smith, chairman of the Temiskaming & Northern Ontario Railway Commission, states that a Kentucky prospector has made a rich strike of gold in Playfair township, about 80 miles north of New Liskeard. Samples showed on assay about 411 oz. gold in addition to 400 oz. silver per ton. The discovery was made three or four days ago and a big rush of prospectors is anticipated. A branch of the railway, which has already been located by the commission, will pass near the new goldfield. Tenders for construction work will be advertised for in a few days.

Willet G. Miller, provincial geologist, who has been engaged in exploration work on the Gillies timber limit during the summer, has returned to Toronto. He leaves next week to attend the International Geological Congress at the City of Mexico. He states that although previous to the Provincial Government undertaking to develop the mineral resources of the Gillies limit, many prospectors claimed to have made discoveries, the standing offer of a bonus of $150 per inch width of vein, to any person who would disclose such discovery, has failed to elicit any information from such alleged discoverers. Despite all rumors and statements to the contrary, the policy of the Government to continue the development of the tract as a public work was thoroughly settled, and work would be steadily prosecuted through the fall and winter.

Johannesburg, Transvaal.

The Coolies and the Posters. Labor Statistics. Mineral Output of the Transvaal. Base-Metal Mining. Tube-Mills for Diamond Washing.

So far the coolies have behaved quite satisfactorily over the new poster, which has been stuck up in the compounds by order of the Liberal Government. There has not been a rush on the part of the coolies to embrace the offer of repatriation, even though it mean a free trip to China. So far the number of applications is between 200 and 300, out of a total of 52,000 coolies employed. The danger is not yet over, but it does not seem likely that there will be a wholesale departure of the coolies. There is still a feeling of uncertainty, however. It is devoutly to be hoped that after two abortive attempts to get the coolies out of the country, the Liberal Government will now drop the Chinese question, and leave the final decision to responsible Government. What that decision will be is, of course, unknown. Many leading men, however, are of the opinion that in spite of all the anti-Chinese talk the decision will be 'pro-Chinese.'

The official labor returns for June show that there are 17,959 whites, 90,882 Kaffirs and 52,352 coolies employed on the gold mines of the Transvaal. The coal mines give employment to 461 whites, and 10,076 Kaffirs. The diamond mines accounted for 664 whites and 5,837 Kaffirs. All other mines and prospects employed 151 whites, and 1,260 Kaffirs. These figures show an increase of 4,458 white workmen over June, 1904. The 52,000 coolies have therefore been the means of employing 4,458 white men in the Transvaal mines.

The Government returns for the statistical year July 1, 1905, to June 30, 1906, show that the mineral production of the Transvaal has increased £3,473,092 over the period 1904 to 1905. The figures are as follows:

Gold production	£22,100,707
Silver "	66,458
Diamond "	968,229
Coal "	837,176
Total	£23,972,570

Truly a splendid total!

An announcement made the other day by a big gold producer employing Chinese shows the feeling of directors. Owing to the uncertainty regarding Chinese labor, it has been decided not to pay the usual dividend as yet. The dividends being paid by the mines of the Central Rand, run by Kaffir labor, are high. A new gold producer in the Central Rand will pay a dividend of 45% this year. Even with the depressed state of things these 'gilt edge' shares stand at figures which do not appeal to the investor. The mine referred to will last about 12 years. On present prices this mine will give an interest of 6%, and return the money. Considering the uncertainty of the future, 6% for a mine investment is none too attractive.

The base metal industry of the Transvaal looks far from cheerful at the present time. Silver mining was tried years ago, and any product of this metal will come as a by-product from lead, or from gold mining, as at present. There were great hopes a year ago that

the Transvaal would become a big tin producer. The proposition that was to "turn out so much tin that the market of the world would be affected," namely 'Sallies,' is just about to close down its mill, after a disastrous run of several months. The shares of this concern stand at five shillings today, whereas a year ago people were paying 140 to 150s. for them. A lead proposition, Edendale Estates, seems to be getting fair results in opening up the property. It is said that it is quite probable that this will turn out a payable mine. Asbestos is coming in for a lot of notice. So far the prospects for copper are not over bright.

Quite a novel idea is a scheme to treat the 'blue ground' (diamantiferous) from the Premier diamond mine by means of tube-mills. A trial run of 1,000 loads has been made. It seems almost impossible for the Premier company to floor its 'blue ground,' as is done at Kimberley, and it is therefore to be hoped that the tube-mill idea will be successful.

London.

Tin Mining in the Malay States. The Cornish Boom. Oroville Dredging. Foreign Capital in the Urals.

The acting Senior Warden of the Federated Malay States in his report on the working of the Mines Department for 1905, gives the total mining revenue derived from all sources as $9,689,501, against $9,249,189 for 1904, an increase in 1905 of $447,312. Of the total amount collected the export duty on tin accounted for $9,249,627, an increase as compared with 1904 of $434,939; the export duty on wolfram yielded $2,213; and the royalty on gold produced only $11,439, as compared with $28,148 in 1904. The output of tin is stated to have been 114,221,333 lb.—a decrease in quantity, as compared with the output of 1904, of 1,662,400 lb. The acting Senior Warden sees no cause for alarm in the decreased output, and is of opinion that no evidence is forthcoming to show that the stanniferous deposits of the country are nearing exhaustion. The gold-mining industry was not prosperous in 1905. The total quantity exported was 9,972 oz., of the approximate value of £39,888. The quantity of ore crushed was 67,421 tons, of which all but 200 tons was treated in Pahang, yielding 9,073 oz. of gold. The only mines that continued working in Pahang at the close of the year were the mines of the Raub Australian Gold Mining Co., where operations were carried on vigorously throughout the year, a force of some 800 men being employed.

Very little information of a genuine character is available regarding the various new enterprises launched in Cornwall on the tin boom; but the returns show that the old established mines are jogging steadily on. It is reported that at Clitters United, the electric pumping plant has been completed, and is expected to commence permanent work at an early date. The directors of Clitters, in view of the developments, have announced their intention to commence the payment of dividends with an interim distribution of 6d. per share. Clitters United claims to be the pioneer in Cornwall in the economical treatment of complex ores. The shareholders subscribed £40,000, and ores of that value have been sold, the profit being re-invested in the mine. The Hingston mine, which is a part of the set, has been drained without fresh capital being called up. The Dolcoath report for the half year ended June 30 shows an advance all along the line. It states that the profit earned amounts to £40,165. Exclusive of slime, the black tin sold was 858 tons 13 cwt., of which the average price realized was £107 11s. 8d. per ton, as compared with 812 tons 4 cwt. 3 qr. 22 lb. sold in the previous half year at an average price of £93 7s. 6d., showing a rise of £14 4s. 2d. The slime sold amounted to 61 tons 11 cwt. 3 qr. 20 lb. at an average price of £79 6s. 2d. per ton, while in the previous half year 54 tons 13 cwt. 3 qr. 27 lb. were sold at an average price of £69 16s. 3d. per ton, showing a rise of £9 9s. 11d. The quantity of tin ore treated was greater by 1,462 tons; 53 tons 5 cwt. 3 qr. 27 lb. more black tin was sold; the quality was 1.22 lb. per ton of ore better; the average value of a ton of ore treated was 6s. 11.04d. higher; and the selling price of black tin was £13 15s. 5d. more than in the previous half year. The general result was an increase of £17,598 in the amount realized, equivalent to 22%. Compared with the half year ended June 30, 1905, the increase is 44½%. The total receipts on profit and loss account give an increase of £18,178. The profit for the half year, added to the balance as per last account, £6,997, makes a total of £47,162. From this must be deducted the amount written off as allowances for depreciations on buildings, plant, etc., £9,482, leaving a balance of £37,679. The dividend recommended at the rate of 15% per annum will absorb £24,296, leaving £13,383 to be carried forward. The starting of Wheal Alfred, at Perranporth, in the once flourishing parish of Perranzabuloe, is reported. In this set there are said to be no less than seven lodes, forming a junction with a main lode which is 13 ft. wide. Most of the mineral raised to the surface is blende and copper. The company has a capital of £30,000. North of Wheal Alfred is the inactive, but celebrated Wheal Leisure, formerly a great copper producer; and northeast is Budnick, which has been worked in a small way by a local party for several years.

It is feared that with the flotation of new companies the Cornish labor difficulty is likely to become more acute, and it is urged that the Cornish miner, of all men, should be the last person in the world to object to a foreigner working in the Cornish mines. He has long neglected the home industry, and has invaded foreign fields with a nerve that does him credit. Having laid down the rule that he himself is free to go where he wills, the Cornish miner could not logically object to Chinese or any other alien laborers coming to the Duchy to dig for him. Another difficulty in the way of obtaining new capital for tin mining in the county is found in the 'dues' or royalties. It would be expecting too much from the owners of the soil to ask them to put their hands in their pockets and subscribe for shares in new ventures, but it is a pleasant recollection that in the case of Wheal Grenville, some few years since the ground landlord helped the shareholders to the extent of some £5,000 to furnish the property with the necessary plant, etc. He now gets as his reward one-fifth of the profits on the present scale of working, and no one having regard to his liberality, begrudges him the money. Other ground landlords have responded to similar appeals in a measure, but if the 'lords' would go further and agree to commute their royalties for shares in the mining companies or to take them out in a percentage on profits, a heavy incubus would be removed from the leading Cornish industry.

The two last weekly gross returns recorded by Oroville Dredging Limited—$24,000 and $17,000—confirm the report that some of the old dredges have been thoroughly overhauled and improved so as to increase their capacity considerably. The profit from Stratton's Independence for July—£3,000 from 1,559 tons of shipping ore averaging 2 oz. 8 dwt. per ton—is slightly better than for the preceding month. The future of this mine is now thought to depend on the solution of the low-grade ore problem which, according to rumors, is about to develop a new phase.

The British commercial agent in Russia reports that the sale of several big mineral enterprises in the Urals has been made to a syndicate of foreign capitalists. The

sales comprise the copper mines in the Atbassarski district of the province of Akmolinsk, the silver-lead works with mines in the Turgaiski territory by the river Kara-Turgai, and the coal deposits in the same territory along the river Bai Konur.

A cable from Cape Town announces that the decision of the English courts on the subject of the liability of the De Beers Co. to pay income-tax in England (noticed in my correspondence last week) gave rise to a discussion in the Cape House of Assembly, when the following resolution was unanimously carried: "That this House regrets the action of the Imperial Government in levying the income-tax on companies which originated in South Africa, and which to all intents and purposes are South African undertakings, and desires most respectfully to point out that such a proceeding may have far-reaching consequences prejudicial to the best interests of the Empire."

Apropos of 'sand-bagging,' Sir Francis Carruthers Gould, who began life as a stockbroker and who for his clever political caricatures is known as the "greatest asset of the Liberal Party," speaking at a dinner the other night, is reported to have said that the Stock Exchange was sometimes scoffed at; but in his judgment there was no place where the standard of morality was higher, or where the line between right and wrong was more sharply drawn.

Bisbee, Arizona.

The Shattuck Tramway. Sale of Mines in the Huachuca Mts. Progress at Tombstone.

A plan is being worked out for the installation of electric power throughout the Copper Queen mines. At the Calumet & Arizona mines the Shattuck-Arizona has been added to the list of producing mines. Just two years after the first work was done on this property with a windlass, preparations for ore shipment were complete. On account of the inaccessibility of the Shattuck by railroad, it was necessary to build a 3,200-ft. aerial tramway to the nearest point where a spur could be built. The tramway is supported by 14 towers, varying in height from 12 to 40 ft. The towers are constructed of 12-in. timbers and are set on concrete foundations. The ore-bins at the loading end of the tramway have a capacity of 1,000 tons. The lower terminal, where the railway cars are loaded, is so constructed that five cars can receive ore at one time. The ore will be loaded directly from the tram buckets into the railroad cars. The tramway will handle 500 tons per diem. The Shattuck people will ship to the Copper Queen smelter. It is expected, however, that they will construct their own smelter next spring. At present two large orebodies are being opened up on the 700 and 800-ft. levels. There are a number of stopes being worked on each level in sulphide and oxide ore. Development work is being prosecuted on the 600, and at the present time the drift is in vein matter and iron ore. On the surface, the steel head-frame is in position and ready for service. The old hoisting engine is being moved to make room for the installation of the hoist borrowed from the Junction. The Allis-Chalmers hoist is expected to arrive by September 15. The Junction hoist will be used until that time. The new 25-drill Sullivan compressor is expected to arrive about September 5.——At the Denn-Arizona, driving continues on the 1,000-ft. level to make connection with the Saginaw. As soon as the drift is north of the diamond-drill bore, a cross-cut will be driven to the latter point. When the drill was put down a year ago, it went through 27 ft. of copper ore, so it is expected that a large body will be opened by the cross-cut. The drift is in altered limestone and is showing favorably. Sinking was discontinued in the shaft, on account of the breaking of a pump. As soon as this is repaired, sinking will be resumed.

It was learned a day or two ago that the Princeton Mining Co., in the Huachucas, had purchased a large amount of adjoining property from Berner & Campbell. These properties are reported showing up well. The Amalgamated people are operating there under the name of the Butte & Arizona.——At Tombstone the new pumps are doing well. Ore shipments from the Tombstone Con. are about as usual.——The Cananea-Central deal is still attracting the attention of the public. It is known that the company has acquired some of the best properties in the Cananea district, and it has already started operations on a large scale.

Cripple Creek, Colorado.

Healthy Activity. New Exploration Company Organized. A Rich Strike. More Mills Being Built. A Peculiar Decision. A Record Shipment From the Vindicator. The Telluride Mill Nearly Ready. The Drainage Adit.

A new company has been formed in the district by several prominent operators titled the Mines Exploration Co. This company will take over and work several promising properties which are now lying idle. The directors include such men as Spencer Penrose and Chas. McNeill of the United States Reduction & Refining Co., C. C. Hamlin of the Granite mine, K. R. Babbitt, and G. C. Jacklin. Mr. Jacklin is general manager of the Utah Copper Company.

The Isabella Gold Mining Co. has bought for its new cyanide plant, now in course of erection, some of the machinery and the vats of the Los Angeles mill, which was burnt to the ground about a year ago. The vats were found to be very little injured by the fire and will shortly be installed in the new mill, which will be running in about two months.——The Strong mine on Battle mountain has again resumed operations after a partial closing down due to the accident several weeks ago to the pumping plant. The machinery is now at work again and it will only be a short time before the lower levels of the mine are accessible for work.——Carlton and associates, lessees, operating on the Lonaconing on Beacon hill have been shipping some ore of good grade. A four-foot vein which is being worked at a depth of 300 ft. is producing about four cars of shipping ore per week, which give returns around four ounces.——Several more lots in the town of Independence have been sold to the Vindicator Gold Mining Co. by the Western Packing Co. for the site of the proposed mill the Vindicator company intends to build.

Marsh, Hodges & Co. operating on the Little Clara claim of the Work company's property, have made a rich strike during the last few days. Work is being carried on through the Moffat tunnel where a rich streak consisting of sand and talc has been cut, carrying free gold. A car per day of ore running on an average $40 per ton is being shipped from this place. The Columbia Mining & Development Co. has erected a large ore-house at the Chicken Hawk mine on Guyot hill. Ore of good grade was cut in the shaft at a depth of 500 ft. and the shaft was then sunk another hundred feet so as to obtain sufficient stoping ground.

The second clean-up within a month has been made by the Home Run cyanide mill which is treating ore from the Home Run claim of the Schuylkill Gold Mining Co. and the Climax No. 2 of the Little Puck Co., both of which are situated on Squaw mountain. The gold brick obtained is valued at $1,400. Sherman Bell is general manager and Dan Mahoney superintendent. It is rumored that another small cyanide mill is to be erected in the district. The Blue Flag Mining & Milling Co. on Raven hill is to build a mill having a capacity of 100

tons per day. Large bodies of low-grade ore have been opened up on the second and third levels of the Blue Flag property and good profits are expected to be obtained from this ore by cyaniding.

The El Paso mine on Beacon hill shipped three cars of five-ounce ore last week from the Little May and Beacon Hill-Ajax claims, where operations are being carried on by lessees and the company. The water has risen in the El Paso shaft lately to the 600-ft. level, and from recent developments it is thought that there will be enough ore above this level to keep the mine in the producing stage until the completion of the drainage adit, which, if started now, should reach the El Paso property within three years.——The Cody shaft of the Granite mine, on Battle mountain, under lease to Messrs. Fry, Becker & Travell, after a shut down of four or five days on account of bad air caused by the wet weather, has resumed operations and will drive the 125-ft. level to connect with the ore-body, which has been stoped by the Portland up to their boundary.

A peculiar decision was rendered by a Justice of the Peace last week, in the case of the people vs. A. R. Pierce; Mr. Pierce was charged with assault with intent to kill. It was proved by five different witnesses that Pierce entered the Christmas shaft-house on Bull hill and at the point of a gun, which he admitted was loaded, ordered the engineer to stop running the hoist which was lowering the men about to go on shift. It was held by the Court that this action did not constitute a cause of action and the prisoner Pierce was discharged. A decision of this kind, if upheld, renders it perfectly lawful for any person in the Cripple Creek district, whenever he feels so inclined, to go upon a property and shut it down in the above manner and no redress can be had.

The 40-drill compressor, which was ordered some time back from a New York firm for the Golden Cycle mine, on Bull hill, has not yet arrived. The foundations are all ready to receive this large piece of machinery, which, when working, will materially aid in the increase of the Golden Cycle output.——The removal of the Vindicator dump is steadily progressing, the waste being shipped away by the railroad free of charge, they are using it for the filling of bridges and trestles on the various lines of the district. The Vindicator mine made a record of 346 mine cars for one day's hoisting last Sunday, which did not include several cars of waste, and made a total of 175 tons of ore hoisted in one day. Few properties have the ore reserves to supply the material, and for handling such an enormous tonnage there are few hoists in the camp capable of doing so in 24 hours. The average grade of ore on 1,700 tons for August, from the Vindicator, will not vary more than a dollar either way from two ounces per ton.

The management of the Telluride mill at Colorado City announce that they will be ready to treat ore October 1; they have, however, ample room for storing ore that will be shipped in the meantime, principally from the Findley. The Golden Cycle Gold Mining Co. purchased the Telluride mill and ore will be treated from that property and the Findley, while other mines in the vicinity of these properties will contribute of their output. It is gratifying to know that the plant has been thoroughly overhauled and put in working order in so short a period of time. It is replete in the latest devices of machinery, and the trust faces the fact that the management is prepared to meet any reduction in rates it may make.

Advices from Colorado Springs state that $500,000 of the amount necessary to construct the drainage adit has been raised, another $100,000 is in sight, and there is not the slightest doubt but that the remaining $100,000 necessary will be forthcoming within a week.

Mining Summary.

ALASKA.

An electric railroad will be built from Ketchikan to Unuk river next year by the Unuk River & Smelting Co., according to J. W. Daly, manager of the company. It owns a wagon road to their Unuk river mine, but requires better transportation facilities. The length of the road will be 42 miles and construction will be started early next spring. The ore which has accumulated on the dumps carries silver and gold. Twenty men are employed stoping in the company's Unuk river property, and many more will be required when facilities have been provided for shipping the ore in a less expensive manner than at present.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—N. L. Jenkins, superintendent of the Home Copper Co., has shipped a large sample of the ore of that company to the Territorial Fair, at Phœnix. This company is now sinking a 100-ft. shaft, and will run an adit 600 ft. to cut a body of ore which assays on an average 30% copper. The rock in which they are now working assays 5% copper, with $4 gold and $10 silver per ton.——Word has been received here of a strike on the 150-ft. level of the total wreck mine, a lead-silver proposition. This mine is under new management. The old company which worked it sank a shaft to a great depth, but this last strike proved that the old company had gone away from the larger orebodies. The new management, among whom are Epes Randolph, E. P. Drew, C. T. Roberts, and L. J. F. Iaeger, began work by sinking 560 ft. away from the old shaft. It is believed that the strike is near the junction of the main vein and a smaller vein. It is thought probable that the company can now stope from 600 to 800 ft.——H. K. Burtch, in charge on the construction of the concentrator recently completed by the Detroit Copper Mining Co., has finished his work here, and gone for a two months' vacation. On his return he will accept a similar position for the Montezuma Copper Co., at Nacozari, Sonora, Mexico, a property owned by the Phelps Dodge Co. George Booth, Mr. Burtch's assistant, will assume charge here.——At the regular annual meeting of the New England & Clifton Copper Co., recently held at Portland, Maine, with one exception, an entirely new board of directors was elected. These two companies, under one management, own some of the most valuable properties in this district, but no satisfactory work has been done on them for over three years. With the new board of directors, however, it is hoped that affairs will change, and that these properties may become dividend payers. The tramway, which has been under construction for some time but which, owing to lack of funds, is still uncompleted, will be finished at once.——At the Gold Belt Development & Reduction Co.'s properties a solid body of manganese-copper ore was uncovered last week. Assays show 30 to 35% copper. The shaft is now down only 15 ft., yet about $4,500 worth of ore has been taken out, which will be shipped to the Detroit Copper Co.'s smelters.

Morenci, August 25.

NAVAJO COUNTY.

It is reported that large tracts of coal land have been discovered and located in the Mogollon mountains, in this county. Thomas Cunningham headed the prospecting expedition.

YAVAPAI COUNTY.

The Rincon Mines Co. is boring for water near Congress Junction.——The Hite Co. has stopped work on the shaft for the present on account of water, but will resume as soon as they can get a pumping plant installed. The shaft is over 400 ft. deep, and there are 800 ft. of drifts. R. J. Rice is superintendent.

CALIFORNIA.

AMADOR COUNTY.

At the Kennedy mine, last week, the non-union miners, Italians and Slavs, went on strike to the number of more than 100, to enforce the placing of safeties on the skips.

About 50 men, members of the Western Federation of Miners, refused to go out with the foreigners, although in sympathy with the request for the protective appliances, as they could not sanction the acts of these men, for nothing had been done regularly in the union with regard thereto, and they looked upon the strike as an effort to force them into a secondary or subordinate position.

NEVADA COUNTY.

With a capital stock of $1,000,000, the Eclipse Mining Co. has been incorporated under the laws of South Dakota. W. B. Simmons is manager and superintendent. The company will develop the Eclipse mine at Gold Flat, near Nevada City, on which considerable work has been done.—The Sultana Co. will build a trolley-line for the transportation of ore from the Sultana mine, formerly the Green Mountain, to the Prescott Hill, a distance of 2,800 ft. Building will soon commence on this undertaking. Ten three-ton cars will constitute a train. The cars will cross the ravine at the Prescott Hill shaft on a high trestle, and will be hauled direct to the rock-breaker in the head-frame. Eventually the Sultana will be worked through the lower levels of the Prescott Hill. The five-stamp mill at the Sultana may be abandoned later, or as soon as the 20-stamp mill at the Prescott Hill shaft is ready for operations.

W. Baltz, F. Bishop, D. Whilden, and other miners have a lease on the Reward mine near Nevada City. It is the intention of the lessees to erect a hoist. When the Reward was worked in 1900 it produced some rich ore and a small mill was kept running there for several years.

SAN BERNARDINO COUNTY.

The smelter at Needles now has in its ore piles $250,000 worth of ore. With the supply on hand and the ore already purchased and being received, the smelter will run steadily for a couple of months. If the coming season should be one of successful development of the prospects around the country, the smelter will receive custom ores sufficient to keep it in continuous operation. With the receipt of ore from the Copper World property of the company and the completion of the copper furnace, it is thought that one of the stacks will be running all the time, and a great portion of the time two will be in operation.

TUOLUMNE COUNTY.

(Special Correspondence).—The Spring Gulch mine, situated southeast of Tuolumne, has been bonded to Truman Schench, of Salt Lake City, who represents Utah and Colorado capitalists. Since the company, which until a few weeks ago worked the property, forfeited its bond, a strike was made by the owners in a raise between the 400 and 500-ft. levels. The present bondholders made a substantial payment on the purchase price when they took the property.—— Paul F. Green, a local mining man, has purchased El Oro mine, situated two miles south of Tuolumne, and will erect a mill on the property. The adit, 290 ft. long, will be extended and stoping commenced. —— Work has been started at the Columbia mine with a force of seven men. This property recently changed hands. It is situated near the town of Columbia.——Preparations are being made for resuming operations at the Hope mine, in the eastern suburb of Sonora. It is the intention to start the mill in the near future. The Hope is a combination pocket and milling mine and yielded largely until recent years. It is owned by local people, Mrs. Julia Ralston, of Sonora, owning the largest interest.

Tuolumne, August 27.

SISKIYOU COUNTY.

(Special Correspondence).—Mining in this section has been active during the past eight months.——The Jumbo near Snowden, in White gulch, is running five stamps on ore stated to return $12 per ton on the plates, with a general average of $6 to $8 per ton. The owners are Holman & Co. The recent litigation on the Lanky Bob mine having been settled, the present owners, under the superintendence of Mr. Poleon, are developing the property and erecting their mill, which will soon be in operation with G. E. Bateman as millman.——The Moltry mine on Tanner mountain, near Sawyers Bar, with $40,000 of ore blocked out, is handicapped by a lawsuit, a condition not unusual when a mine becomes of value. The latest reports indicate an early settlement of the difficulties.——An aerial tramway to the south fork of the Salmon, where the mill will be situated, is being considered. The vein is from 18 to 30 in. wide, and the ore will, it is claimed, average $30 per ton.——Some excellent ore has been found in the Highland mine in China gulch, much of it being specimen rock. The owners are Letherow & Co. ——At Taylor lake the Harris mine is being developed. Several pockets have been found recently, beside average ore. The vein is usually 15 ft. wide and in some places 25 ft. The two-stamp mill is running on excellent ore.—— Five stamps are running at the Advance mine under direction of Mr. Brokaw. This property is being thoroughly developed. It is stated that $100,000 has been blocked out in the mine.——Near Sawyer's Bar, little hydraulic work is going on, it being now late in the season for water. About the only property under way is the Ball mine, now owned by the California Con. Mining Co., of Boston, Mass., under the superintendence of Charles W. Raymond, who has had charge of the work since last January, when the present company took hold. As long as water was sufficient the 20-stamp mill was in operation. Since about May last the lower mines on the Mountain Laurel group have been systematically developed. The upper levels have been connected with the lower by shaft and the pay-shoot found to be more extensive than supposed, the previous owners having been stopped by litigation, just a few feet short of high-grade ore. This pay-shoot shows a width of one to four feet of ore-ribbon rock in black slate. The 100-ft. level is reported to show a pay-shoot over 200 ft. long, the ore of which will average three to four feet and assay $15 gold per ton. The ore is free-milling with 1 to 3% sulphides assaying $60 to $150 gold per ton. A drift is being advanced on the 230-ft. level.——Plans are being made to get electric power at Sawyers Bar, with a transmission line about four miles to the mill. This is likely to be done next season. The indications are that the mine will be thoroughly developed before further improvements are placed on the property. Wayland H. Young is manager.——About 10 miles southerly from the Ball mines are the King Solomon mines, owned by the Canyon Mining Co. of New Hampshire. This property is at present idle, having been developed during the past winter, but it is reported that active operations will begin as soon as the new wagon-road is extended to these mines, when machinery can be hauled at reasonable cost. ——The Copper claims, below Bennett, at Nordheim, on Crapo mountain, 30 miles from Sawyers Bar, are showing excellent copper and gold ore, but as work has only just been started it is too early to make predictions.

Etna Mills, August 25.

COLORADO.

PARK COUNTY.

(Special Correspondence).—Several adits are being driven in the vicinity of the London mine, which is the largest producer in the county, shipping 50 tons of ore per day. It is reported that this mine is producing over $1,000,000 per year.——The Pawnee Gold Mining Co. has about 400 ft. of adit. It is driving on a fissure and estimates it will strike ore within 200 ft. The company is composed of Rochester, N. Y., and Iowa people. A. M. Anderson is manager. —— The Butte Gold Mining Co. has men at work driving in Pennsylvania mountain directly across from the London, on the fault. The adit is in over 500 ft. The mine is controlled by the owners of the Vindicator mine, in the Cripple Creek district.——The London Extension Mining Co., composed of Ohio people, claim to have reached the same character of ore as that taken out by the London Co. —— The South Mosquito Mining Co., Carnahan, Moffat & Mosher, owners, recently installed a power-plant. The adit on this property is in 600 ft. —— C. E. Street, manager of the Ophir mine, has several hundred feet of development work on the property. —— The Clipper Con. Mining Co. recently made a shipment of high-grade ore. —— The London-Twist is still driving its adit. The company has been working for two years in hope of tapping the old London vein. —— The New York, above the London-Twist, has been developing for several months and has resumed shipments. —— The Hock-Hocking mine is again shipping good ore. —— Toledo, Ohio

parties, are developing what is known as the Broom of the Hills mine. P. T. Rigg is in charge. —— W. E. Thorne, manager of the Snowstorm Hydraulic Co., has a large force at work on the placers. Three giants are in operation. A clean-up will not be made until they close down for the season, but it is believed they are operating in good ground, as it was thoroughly tested before starting. Work has been handicapped by the delay in delivery of new pipe and by the scarcity of men. Nearly every district in the State reports a shortage of men. —— R. S. Bartley, of Denver, has a lease on the small mill at the town of Montgomery, and is getting same in shape to handle ore.

Alma, August 24.

SUMMIT COUNTY.

(Special Correspondence).—Affairs at the Oro mine are now straightened out, and the mine is in shape for operation. The Wellington Mines Co. is reported to be endeavoring to secure an option on this producer to consolidate it with its other holdings.——The Helen group of claims, situated at the junction of Australia and French gulches, below Bald mountain, has been leased to Griffith & Engle. This property contains large veins of high-grade, free-milling gold ore, and with a mill at the mine, could be made to pay handsomely. The lessees intend to install a hoisting-plant and sink a shaft in the gulch on a quartz outcrop 12 ft. wide, the ore of which assays well.——Dean & Sullinger have made a rich strike on the Vossburg, on Mount Helen. The situation of this vein is such as to make it difficult of access, and it will take some time to get connections made for transportation.——The Bullion King is still making a good record under the lease of Foote & Hight. High-grade zinc ore is the chief product.——The new mill and reduction works on the Wire Patch are nearing completion and are expected to start operations early next month.——The Pennsylvania mine, at Argentine, is shipping ore regularly, as well as running its 40-stamp mill and producing a good grade of concentrate.——The King Solomon, at Frisco, is making good progress with its main development adit. The president, F. C. Dinsmore, brought a party of Eastern investors from Denver to see the property.

Breckenridge, August 24.

(Special Correspondence).—The Country Boy mine, on Nigger Hill, is proving a bonanza to the Lanyon Zinc Co., of Iola, Kansas. Since this company took the lease on the property they have mined and shipped over 1,000 tons of high-grade zinc ore. During the month of July over 450 tons were sent to the zinc works at Iola. This ore ran nearly 50% zinc. The ore is granular and has the appearance of concentrate and is easily mined, being picked down and shoveled into the cars without blasting. On each side of the main streak, which averages three feet in width, there is a good width of lower grade ore which is being piled for future treatment by concentration.——At the Kitty Innes an increased force of miners has been put to work in the lower adit. After driving this 60 ft. further a raise will be cut in the ore-shoot to connect with No. 2 level, when stoping will commence. The outlook of this property is exceptionally good.——Coffelt & Deaner are now working the June property under lease, and shipping high-grade gold-silver ore.——Montezuma camp is showing up well this year and many new enterprises are now being organized. The Lenawee Mining & Milling Co. now has its mill completed, and stamps dropping. This company has secured control of the Fisherman mine, which is now furnishing an abundance of ore for the mill. The Little Jumbo property, which has a fine record among the shippers of the camp, is now being operated by E. W. Fairchild of Montezuma.——The Lucky Baldwin, on Collier mountain, another shipper of high-grade ore, is being worked by A. L. Harrison and George Worthington. The ore runs high in copper, and shipments of $60 ore is not unusual.——Orizaba is the name of a new company operating on Wise mountain, under the management of S. F. Stoughton.——The Braganza, on the north side of Collier mountain, is to be worked vigorously this summer. Mr. Nikirk is now having the road fixed for hauling the ore to Keystone.——Swandyke Camp is showing signs of renewed activity, on account of the general improvement in mining matters in Summit county.——Windy mountain was the scene of an important strike last week by C. F. Appleman, who uncovered a vein of lead ore two feet wide assaying $50 per ton.——In the Three Kings, Eibs & Co. have reached their main vein by a cross-cut adit in Sheep mountain. Ten to fifteen inches of high-grade zinc ore is now shown. The shaft on the I. C. N. property is being sunk on a vein, the ore from which assays 15 to 20% zinc and 15 oz. silver per ton. C. H. Johnson has charge of this work. ——P. L. Cummings reports a good find of copper on his property on French pass, near Mount Baldy. The property is difficult of access, being above timber line, but the quality of the ore is such as to warrant operating under the difficulties of transportation which attends such situations.

Breckenridge, Colo., August 24.

(Special Correspondence).—Near the top of Hoosier Pass, John L. Roberts, of Alma, has begun operations on the old Bemrose mine for Elmer Loring, of Brockton, Mass., president of the Hoosier Pass Gold Mining Co., who is at present at Breckenridge looking after his mining interests. The shaft on this property is down 118 ft., with a cross-cut of 100 ft., where the vein was cut. It is the intention to sink 400 ft. deeper. The mine is equipped with hoisting plant and surface buildings. This old mine has been worked spasmodically for years, but it is now the intention of the Eastern owners to develop it extensively.——A short distance from the Bemrose, Mickey Howe is developing the Wonderful mine, and also operating the Senator, farther down the hill, and near the head of the Blue. In the vicinity of the Senator, Arthur Howard has charge of the O'Reilly Gold Mining Co.'s property for Boston people. The Governor mine on the Blue, above town, has been in litigation for a number of years, but the difficulty is about to be settled and operations again started. This was a large producer at one time.——Kennedy & Case are prospecting in McCullough gulch, where they claim to be finding good ore.——B. F. Anderson, manager of the Old Union mine and mill, is treating 45 tons per day in the mill, which has a capacity of 100 tons per day, but owing to the scarcity of men he is unable to produce a greater tonnage.——The Reliance dredge in French gulch, under the management of Ben Stanley Revett, has discontinued operations for a few days on account of a broken shaft. Mr. Revett is of the opinion that four or five new dredges will be built here next year. He expects to install another on his property. He is also testing ground on the old North American property, for which he was manager at one time, with a view of taking a lease on it. Should the ground prove what he thinks it to be, and the lease be granted, he will build a dredge on that ground.——About 500 tons of zinc ore is being extracted at present from the Country Boy mine, a short distance above the Old Union mill, in French gulch. The ore averages over 50% zinc by the carload. The property is being operated by the Lanyon Zinc Co. It is understood that an adit is to be driven from the bottom of the gulch. The ore is of such a nature that it requires no blasting. Occasionally the miners are obliged to blast the walls where the vein narrows, but on the whole, very little powder is used in the mine.——Across the gulch from the Country Boy, the Wellington mine is being operated. The control of this property has been sold by R. W. Foote to Kansas City parties. The final payment is nearly due, and when made it is stated they intend erecting a mill. They have a large amount of medium-grade ore on the dump in addition to that blocked out in the mine.——Some work is being done at the Lucky and Minnie properties by Chas. Putner, of the Wire Patch.——The old Jessie property, on Gold Run, is being operated by lessees—James T. Hogan, president, and C. F. Gilbert, manager. At present they are operating with 25 men, but would put on more if they were available. The mill contains 40 stamps, and is yielding a concentrate for shipment.——This district is enjoying a good, substantial prosperity and with the present price of zinc and lead there is no reason why it should not continue.

Breckenridge, August 25.

IDAHO.

BLAINE COUNTY.

The Lipman Mines & Tunnel Co., under direction of M. H. Lipman, is driving an adit near Hailey that will tap

the Bullion veins at a depth of 1,200 ft. The long adit being run on Boulder creek by a Boise company will develop another district near Hailey.

Two feet of ore have been cut in a raise from the adit driven to tap the Galena Belle and other veins in the property of the Carbonate Hill Mining Co., situated on Cherry creek, two miles east of Galena. Four samples taken from the vein assayed from $60 to $160 per ton, of which 48 to 60% is galena, 40 to 200 oz. silver and $7 gold. The long adit was run to tap another vein that outcrops in the company's property. An exploring drift had been driven 20 ft. in this body.

WASHINGTON COUNTY.

In the Warren district, shipments of bullion have recently been made from the Silver King mine averaging about 225 lb., being the result of a 40 days' run. The mine is reported showing up well and some bodies of ore of good grade are being opened.

MONTANA.

FERGUS COUNTY.

George M. Nelson of the Chicago-Montana Gold Mining Co. is in St. Paul, Minn., arranging to re-open the company's mines near Gilt Edge.

SILVER BOW COUNTY.

Copper production is being handicapped somewhat in Butte by lack of miners. Never before in the history of the district has there been a lack of competent miners, but at present nearly all the big companies are short of men and some companies are offering to pay above the union scale. Shaft men, ordinarily paid $3.50, can get $5 per day, while the Pittsburgh & Montana Co. is paying ordinary miners $4 per day. The labor shortage is responsible for the decrease in the output of ore and copper.

NEVADA.

NYE COUNTY.

(Special Correspondence).—Notwithstanding the boom at the new camp of Monarch, which has taken hundreds of people from Manhattan, Tonopah and Goldfield, Manhattan is still prospering. Last night the news came in that a strike had been made on the Searchlight claim, one mile northeast of town, where a vein eight inches to one foot wide, averaging $400 per ton gold, was found. A rich stringer two inches in width was found on the surface of the Searchlight claim several weeks ago. A shaft was started below this find, and at a depth of 50 ft. a cross-cut was started to strike this vein, which it encountered last night, as stated above. The ore is being sacked.——A new placer discovery was made on the property of the Manhattan Whale, and when traced, was found to extend into the property of the Manhattan Crescent. It is said 34 oz. of gold was taken from the ground yesterday by means of dry washers. This eclipses all other placer discoveries in camp to date.——A contract has been closed for extending the cross-cut from the 75-ft. level on the Manhattan Cowboy Mining Co. From indications on the surface, a large vein will be found within the next 25 ft., at a depth of about 120 ft.—— In the adit of the Georgey group of the Manhattan Nevada Gold Mines Co., the vein is widening and the ore increasing in value. The vein cut a few days ago in the breast of the adit is five feet wide and pans well.——The Toquima Copper Co., owning copper deposits a short distance east of the Con. Manhattan and Manhattan Mammoth properties, at East Manhattan, will build a concentrator.——Some samples of ore were brought to town today from the new camp of Monarch, which assay high in copper, as well as carrying payable quantities of gold and silver. Almost every merchant of means in Manhattan and Tonopah will have branch stores in the new camp of Monarch. Loads of supplies and lumber are now on the road, and building is in progress. Fifty-five frame buildings will immediately be put up. The town has increased from seven tents a week ago to nearly 75 today.

Manhattan, Nevada, August 25.

EUREKA COUNTY.

The Eureka district is developing rapidly and the present season has seen a notable change in every way throughout this region. A large number of the properties, whose achievements in the early days are matters of history, are being prepared for production. Within the past 10 months 45 new locations have been made Among the new mines, the Van Nortan is producing shipping ore. Numerous properties, with abundant tonnage of low-grade ore, which could not be successfully operated under the old rates for transportation, are being worked at a profit under the new condition of affairs. Everything is contributing to the prosperity of both the high and low-grade propositions in the district. Operations are handicapped by insufficient railroad facilities. All the ore shipped over the road has to be transferred by shovel from the narrow-gauge to the broad-gauge cars at Palisade, for the reason that sufficient labor cannot be secured, either in Nevada or the surrounding States, to complete the construction of the ore transferbins. —— From the United States mines on Ruby hill, ore shipments are being made as fast as the railroad can haul it away, and with improved transportation facilities a still greater tonnage will be sent from these properties. The United States Co.'s office building, the mess, bunk and store-houses are nearing completion; to these are being added the residence of the superintendent and the assay office.

NEW MEXICO.

GRANT COUNTY.

In the Carpenter mining district, just across the Black range from Kingston, the Monarch Mining & Development Co. has taken a 90-day bond on ths Swartz-Spats group of 17 claims, the company agreeing to spend $2,500 in development. These properties adjoin the Grandview group, owned by C. T. Barr, of Kingston. —— The Enterprise Mining & Milling Co., owners of the Enterprise and Perseverance claims, are building a 100-ton mill. The ore is free-milling and runs from $15 to $20 per ton gold.

WYOMING.

CARBON COUNTY.

A 15-ft. vein of copper ore was cut recently in an adit being driven in the property of the Morris Mining Co., near Encampment. The vein was cut at a depth of 150 ft., and 500 ft. from the mouth of the adit. There is also said to be a cross-vein of gold-bearing quartz in this property.

CANADA.

BRITISH COLUMBIA.

The Northport smelter is to be re-opened and operated on ore shipped from Le Roi mine at Rossland, an agreement having been reached between the Le Roi Co. and the Consolidated Mining & Smelting Co. Owing to the discovery of new shoots of high-grade ore in the Centre Star and the War Eagle and a large increase in the quantity of custom ore from outside mines there was no particular necessity for Le Roi ore, but under the circumstances the Consolidated Co. has agreed that the Le Roi may furnish 60,000 tons of ore to the Trail smelter within the next several months at a guaranteed minimum and maximum rate.——Shipments for the week ending August 25 were: Centre Star, 1,950 tons, Le Roi, 2,820; Le Roi No. 2, 450. Total for the week, 5,220, and for the year, 206,613 tons. At the Trail smelter there were received during the week 5,430 tons in addition to that received from the Rossland camp. The following mines sent in shipments: Snowstorm, Larsen, Idaho, 63 tons; Snowshoe, Phoenix, 63 tons; St. Eugene, 41 tons; Iron Mask, Kamloops, 455 tons.——The Boundary mines' shipment for the week ending August 25 was increased over last week's figures, the Idaho mine being on the list for the first time. Shipments were made as follows: To Granby smelter—From Granby mines, 17,944 tons; from Skylark mine, 20 tons. Dominion Copper Co. smelter—From Brooklyn-Stemwinder, 2,763 tons; from Idaho, 330 tons; from Rawhide, 858 tons; from Sunset, 726 tons; from Mountain Rose, 72 tons. To Trail smelter—From Snowshoe, 620 tons. To Nelson smelter—From Emma, 255 tons. Total shipment for week, 23,588 tons. Total shipments for year to date, 795,092 tons. Boundary smelters' treatment for week was: Granby, 15,495 tons; Dominion Copper Co., smelter, 4,749 tons; total for week, 20,244 tons; total for year to date, 790,212 tons.

Personal.

J. H. MACKENZIE starts for Dawson this week.

F. W. BRADLEY is at the Alaska-Treadwell mine.

J. V. N. DORR has returned to Deadwood from Denver.

W. L. AUSTIN has gone to Denver from Clifton, Arizona.

F. L. BOSQUI has been to Tonopah on his return from Denver.

THEODORE J. HOOVER is in New York, on his way to London.

ARTHUR L. WALKER has returned to New York, temporarily.

H. FOSTER BAIN is on his way to the Geological Congress at Mexico City.

FRANK LAWRANCE, of South Australia, is at Idaho Springs, Colorado.

F. H. MINARD, on his return from British Columbia, has gone to New York.

M. F. MURRAY is manager of the Gold Development Co., near Marysvale, Utah.

JOHN ROSS, JR., of Sutter Creek, is at the Granite Hill mine, Grants Pass, Oregon.

J. H. G. WOLF is examining the mines of the Tonopah Exploration Co. in Nevada.

EDWARD SAMPLES is manager of the Gold Bar Mining Co., Spokane, Washington.

J. BRUCE MARRIOTT is on his way to Buenos Ayres, to inspect mines in the Argentine.

O. WISER is manager of the Kimberley-Nevada Gold Mining Co., at Kimberley, Nevada.

M. J. CONNELL, formerly of Butte and now living at Los Angeles, visited Monterey this week.

ALLEN H. ROGERS has resigned from the service of the American Smelters Securities Corporation.

J. A. COX, of Colorado, is manager of the Annie Laurie mine in the Gold Mountain district, Nevada.

FRANK L. NASON has returned to West Haven, Conn., from a professional journey to Newfoundland.

W. A. MICHELL is on his way to northwestern Australia, where he is manager of the Balla Balla copper mines.

BERNARD MACDONALD has returned to Guanajuato from an important inspection in western Durango, Mexico.

O. P. ANKENY is superintendent of the Gilt Edge-Maid Mining Co., operating near Deadwood, South Dakota.

ELMER LORING, of Brockton, Mass., is in Breckenridge, Colo., looking over his mining interests in that vicinity.

W. LAWLOR, of Fremont, Neb., has been looking after his mining interests in the Black Hills of South Dakota.

T. J. GRIER, general superintendent of the Homestake mine at Lead, South Dakota, is on his way home from England.

R. R. LUND has been appointed chemist and assayer at the Old Union Mining & Milling Co., of Breckenridge, Colorado.

JOHN A. CRAWFORD has resigned as master mechanic of the Dominion Copper Co.'s smelter at Grand Forks, British Columbia.

W. L. BOWRON has gone to Grass Valley to take charge of the cyanide plant of the New York-Grass Valley Mining Company.

GEORGE A. BAIRD, president of the Western Exploration Co., has returned to Chicago after making an inspection of his Utah mines.

FREDERICK GRUNDY has returned to Los Angeles from examining mines in southern Nevada and he is now in northern California.

N. C. BONNEVIE, general manager of the Denver Ore Testing & Sampling Co., is visiting Alma and Breckenridge on professional business.

HUGH ROSE has been appointed assistant to the superintendent of mining operations (CORTLANDT E. PALMER) of the American Smelters Securities Corporation.

THOS. R. WEBB, formerly with the Gold Pig mine in San Bernardino county, Cal., is now general manager for the Rothschild's Gold & Silver Mining Co. at Argentine, Colorado.

Books Received.

THE CYANIDE PROCESS, by Alfred S. Miller (second edition), has just been issued. This work describes in a general way the methods employed in the operation of the cyanide process, the interfering substances (cyanicides); the chemistry of the process, etc., and brief illustrated descriptions of some of the more important cyanide plants. Sent by the MINING AND SCIENTIFIC PRESS upon receipt of price, $1. John Wiley & Sons, publishers, New York City; Chapman & Hall, London.

Trade Treatises.

THE DEISTER CONCENTRATOR is fully described and illustrated in a handsome pamphlet issued by the Deister Concentrator Co., of Fort Wayne, Ind. The Deister is a new form of the table type of concentrating machine, and differs materially in construction from other table machines. It is claimed that but one-fifth horsepower is required to operate the machine when running at 320 vibrations per minute.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, August 29.

Con. Virginia	$0.97	Manhattan Con	$1.00
Ophir	3.65	Jumping Jack	0.44
Savage	1.00	Midway	2.20
Tonopah Ex	5.50	Montana	2.92
Belmont	5.15	Mohawk	3.95
Jim Butler	1.45	Silver Pick	0.52
Jumbo	1.45	Sandstorm	0.80

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 23. £ s. d.	August 30. £ s. d.
Camp Bird	1 4 6	1 6 9
El Oro	1 12 6	1 13 0
Esperanza	3 13 1¼	3 2 6
Dolores	1 18 3	1 13 9
Oroville Dredging	0 19 6	0 18 9
Stratton's Independence	0 4 3	0 4 6
Tomboy	1 5 0	1 4 4½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 23.	Average Prices for Week Ending August 30.
Copper—Lake (cents per lb)	18⅜ @18¾	18¾
" Electrolytic "	18 5/16 @18½	18 5/16 @18 9/16
" Casting "	18 @18⅛	18 @18⅛
Lead "	5.75	5.75
Spelter "	6.025	6.025
Silver (cents per oz.)	66⅝	66¾

CURB QUOTATIONS—NEW YORK.

	Prices for August 23.	Prices for August 30.
Bingham Central	2¼	2¼
Boston Copper	28¾	29¼
Calumet & Arizona	161/2	161/2
Cumberland Ely	9	9⅛
Dolores	9	7½
El Rayo	5	5
Guanajuato Con	5½	5⅜
Giroux Con	7⅜	7
Greene Con	25⅛	24⅞
Nevada Con	18⅜	18¼
Nipissing	6⅝	7
Tennessee Copper	45	45
Tonopah Ex	5⅞	5⅝
Tonopah-Belmont	5⅛	4.90
Tonopah	18¼	18¼
United Copper	64¾	62⅞
Utah Copper	29⅜	29

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

STRONTIUM is obtained mostly from its sulphate, celestite. It is used in the preparation of 'red-fire' in pyrotechnics. It is prepared by the electrolysis of the fused chloride.

FREE-MILLING GOLD ORE occurs in California from the outcrop of veins at the surface to a depth of 3,000 ft. or more, in both Nevada and Amador counties, and in the Bendigo field of Australia, at a depth exceeding 4,000 feet.

WHERE mispickel occurs in ore in depth, its presence may usually be detected at the surface by the peculiar yellowish to grayish-green color of arsenic oxide which discolors the ore in the superficial portion of the deposit or vein.

IN a district where veins are irregular in dip, the best way is first to sink a shaft on the vein for prospecting purposes, and when the direction of average dip has been ascertained, a working shaft may be sunk where it will prove most convenient and economical in handling the ore. Shafts sunk on a vein which frequently changes its dip and strike are usually unsatisfactory and increase the cost of mining.

IN Charters Towers district, Queensland, Australia, good timber being scarce and long timbers with difficulty obtainable, the method of support adopted is there known as the 'pig-sty.' The sty is built up as a crib and filled with waste rock, reaching upward to the hanging wall. The ground is heavy and swells on exposure, making timbering additionally expensive on account of frequent necessary repairs.

IN the gold mines of the Kalgoorlie field, Western Australia, the water is not fresh, as in most mines elsewhere. It contains from 6 to 19% solids. That from the Great Boulder, on evaporation, yields sodium chloride, 11.164%; magnesium chloride, 1.425; calcium sulphate, 0.462; lime, 0.4223, a total of 13.473%. The water was formerly sold at the collar of the shaft for $1.25 to $1.50 per 1,000 gal. This was before water was piped into the district from Helen river.

AN ORE which carries disseminated lead sulphide (galena), may also contain silver and gold. A careful separation of the lead ore from the gangue and assay of the products of concentration will then determine whether the precious metals are only associated with the lead sulphide or occur in the gangue as well. In some instances the gold is most abundant in the quartz, and the silver is closely associated with the lead, but concentration separates most of the gold from the gangue, collecting it with the lead-silver minerals. In such ore the gold may usually be recovered by amalgamation before concentration.

MOUNT MORGAN, the noted gold mine of Queensland, Australia, is practically a hill of gold-bearing mineral. Originally its summit was about 600 ft. above the Dee river which flows at the base of the hill. The outcrop was a heavy cap of ironstone, the greater portion of which has since been removed. Most of the material beneath the iron cap is silicious kaolin and has a dry, chalky appearance. The great open-cut is dazzlingly white in the sunlight. At depth the rock constituting the ore becomes hard, dense, and dull gray in color, scintillating with the bright particles of iron sulphide. The original rock-mass is described as felsite, which is intruded in every direction by dikes of diabase.

BARON VON RICHTHOFEN wrote a treatise, entitled, 'A Natural Succession of Volcanic Rocks,' in which he attempted to prove that igneous rocks of the various kinds were ejected, in any particular district, in a regularly successive order, and that these eruptions were not a matter of haphazard occurrence. His conclusions were based largely upon the occurrence of the eruptive rocks in Washoe district, Nevada (Comstock Lode). It has since been shown in widely separated regions of the world that Von Richthofen's theory of geological succession of eruptive rocks is well supported by facts. This valuable contribution to the literature of mining was published as a memoir of the California Academy of Sciences, in 1867.

ANNUAL ASSESSMENT WORK must be done on unpatented mining claims by the owner, or by some one in his employ, or at his instance. Work done by a stranger cannot be credited to annual assessment. It is possible that work done by a friend with the consent of the owner might be properly called assessment work. If there is any likelihood of serious dispute, and the owner is still in possession of the property, the safer way would be to begin at once work and continue it until $100 worth has been performed. The law is such, that although the claimholder may have done no work for several years, his title is good until some other person appropriates that which the original locator evidently thinks worthless, but the owner having commenced work, no stranger may interfere, and the Government does not require the labor due in past years.

FAULTS have occurred in the rocks of every geological age, and similar processes are operative now. The greater number of earthquakes occurring within historical time has been due to movement of rock-masses on fault-planes. Such was the earthquake occurring on the Pacific Coast of California on April 18, 1906, and that which visited Chile, S. A., on the sixteenth of the present month. The greatest faults known to geologists represent displacements, of rock strata, of many thousands of feet, but none of these great movements were abrupt. In most cases erosion has nearly kept pace with the movement of the rising side, as is well illustrated in the Hurricane fault, crossing the Grand canyon of the Colorado river in Arizona, where in a maximum displacement of 12,000 ft., the rising side has been eroded at a rate which permitted it to gain only 1,000 ft. in elevation over the lower side.

THE simplest form of condenser employed in distilling the salt water in Western Australia was constructed of five cubical tanks of 500 gal. capacity each. These tanks are set on edge to form a boiler 20 ft. long. A similar row is set parallel with the first, with the edges adjoining. These are built in with stone or brick, a fireplace being provided in front between the two lines of tanks, and flues so arranged that the heat after passing beneath the boilers returns to a chimney near the fireplace. The tanks are connected below, while above they lead to a common pipe through which the steam passes. This pipe leads to a closed jacket which surrounds a galvanized iron tank, the tank itself being full of the salt water, which has to be distilled. A portion of the steam generated is condensed to water and drains away to a reservoir. The water in the tank is raised to near the boiling point through its contact with the steam, and runs continuously into the first tanks, or those on each side of the fireplace. The salts in the water, which soon deposit, are blown out at the opposite end of the improvised boiler from time to time.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Copper in Cyanide Solutions.

The Editor:

Sir—I am on my way back to the mines again. Just had a letter from my cyanide man, which says we are getting a fearful lot of copper in the zinc-boxes. Will you send me, to my address at the mine, anything that has been printed of late on this subject, for all I know seems very meagre on the matter.

R. B. S.

New Orleans, August 14, 1906.

The presence of copper in ores causes decomposition or loss of cyanide when they are treated by the cyanide process, especially when it occurs in the form of carbonate, each pound of copper dissolved combining with about four pounds of potassium cyanide. A further trouble is met in the precipitation by means of zinc-shaving, owing to the tendency of the copper to form a firm metallic coating on the surface of the shaving, when the cyanide solutions used are comparatively weak. With stronger solutions less copper is precipitated, and then in a more loose and spongy form, which does not prevent the deposition of gold and silver. The experiments of Von Oettingen (*Journal* Chem. & Met. Soc. South Africa, Feb., 1899, and *Proceedings*, Vol. II, pp. 557–570), and of Christy (*Transactions* A. I. M. E., Sept. 1899), show that the difference of potential between zinc and copper is greatest in very weak solutions of KCN, becoming very small in strong solutions. This is brought out in a graphic manner in Prof. Christy's Fig. 19. Experiments and working results quoted by Sharwood (*Proceedings* 13th Convention California Miners' Assoc'n, pp. 209, 210, MINING AND SCIENTIFIC PRESS, April 29, May 6 and 13, 1905) show that much more of the copper present was thrown down from weak than from stronger solutions. See also Browne (MINING AND SCIENTIFIC PRESS, Jan. 24, 1903).

Whether it will pay best to use stronger solutions, or to add cyanide before precipitating, or to substitute some other method of treatment or of precipitation, will depend on a number of circumstances. This is discussed by Julian & Smart (Cyaniding Gold and Silver Ores, p. 209). The dipping of zinc-shaving in a solution of lead, patented by MacArthur, was intended to overcome the difficulty caused by copper in the zinc-box. Another patented process (Porter's) is said to be used at the Bagdad-Chase mine, the gold being precipitated by zinc shaving and the copper afterward removed by prolonged treatment with zinc-dust and ammonia. This was described in the MINING AND SCIENTIFIC PRESS of May 20, 1905.—EDITOR.

The Flood of Gold.

The Editor:

Sir—Since the annual production of gold has been climbing up beyond the figure of 300 million dollars' worth annually it has become less valuable, as indicated by the rising price of commodities; that is, the purchasing value of money, based upon a gold standard, has been decreasing. As a result of this, labor has demanded a larger money compensation; and, with increasing prosperity, has often secured it; but the habit having been formed by the workingman of demanding more may, in the future, have to be met by the employer of labor by organization, just as the laborer has employed it to obtain his increased pay. So long as greed exists, either on the part of the employers or employed, conflicts are sure to result. I recollect some years ago noticing on the rocks adjoining a canyon road of a mining camp a sign painted by some down-trodden agitator and prospector in the words, "Suppress greed or this republic dies." Later on I found the average prospector, coming to our reduction works to obtain assays, was ready with every specious excuse to get his work done without having to pay for it. Indeed, greed is a trait which recognizes no condition of life but is found everywhere, among the highest and lowest. That high wages no better satisfy than low ones is exemplified by a case in my experience in 1884 during prosperous times in Leadville. The local bricklayer, busy on the construction of roasting furnaces, was receiving $6.50 per day payable every two weeks. Before the two weeks were up these men were owing for their board, having blown in their wages shortly after payday. Dissatisfied with their pay these men went on strike for $7 per day. One of the walking delegates therefore appeared upon the scene where the brick-layer was busy at the furnace and asked him: "Jim, are you going to work for $6.50 per day?" "I'm damned if I do" replied Jim, and throwing down his trowel he walked off.

L. S. A.

Berkeley, August 9, 1906.

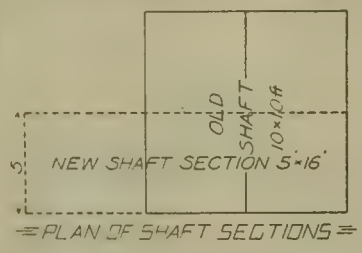
Best Shape for a Shaft.—II.

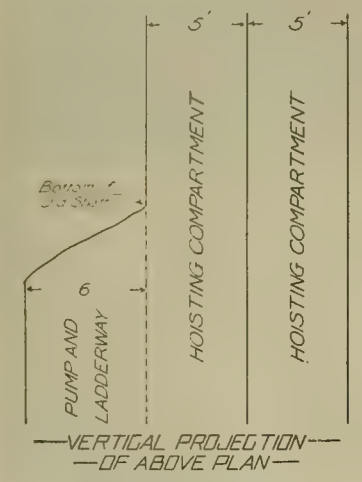
The Editor:

Sir — Alexander Forsyth favors the 5 by 16 ft. shaft, and considers it well adapted to the probable requirements of the mine in question, but points out the fact that no mention has been made of the character of rock-handling appliances to be used in the shaft. He also suggests the advantage of an auxiliary timber-hoist in a separate compartment, which would permit the exclusive use of the other compartments for the hoisting of ore. He discusses the amount of timber required in shafts of the various shapes that have been proposed, but says he can see no necessity for enlarging the shaft to 10 by 16 ft. The final suggestion of Mr. Forsyth is that the lower portion of the shaft be sunk beneath a bulkhead constructed at some convenient point in the shaft, hoisting being done by an auxiliary engine placed above the bulkhead. This is an excellent idea, and one frequently adopted in deepening shafts in working mines, below levels already opened, which Mr. Forsyth assumes to be the case in this instance. It permits the uninterrupted conduct of mining operations while shaft-sinking is in progress. The waste rock, or ore, is hoisted and automatically dumped into a pocket or bin, from which it may be drawn into cars and distributed where required in stopes for filling, or, if ore, it is drawn into a skip and hoisted to the surface; but if only shaft-sinking is being done, and there are no stopes to fill above, there is no apparent advantage in this extra hoist and additional handling of rock underground. He concludes by truthfully saying: "I believe that local conditions so influence this shaft question that unless the local conditions in two places are first found to be similar, argument from authority is of little avail."

R. V. Norris shows that an attempt to sink a shaft to neat lines is usually impossible, and that although the 5 by 16 ft. shaft contains but 80 cu. ft. to the foot in depth, and the 10 by 10 ft. shaft contains 100 cu. ft. per foot in depth, as it is usually impossible to excavate hard rock to these neat lines, the ratio of any excess of excavation beyond these lines is increasingly in favor of the square shaft. Mr. Norris also thinks that fewer and deeper holes can be employed in breaking ground in a 10 by 10 ft. shaft than in one 5 by 16 ft., and that there would be less shattering of the sides. As a general proposition this is theoretically correct, but the character of the rock to be excavated, its hardness, cleavage, and the direction and amount of dip are important factors in the consideration of this propo-

sition. It must be ascertained by experiment to what depth holes will clear themselves in any particular kind of rock. The necessity of carrying timber close to the bottom of the shaft also influences to some extent the depth of holes and the quantity of dynamite that may be safely used in shaft-sinking. Mr. Norris ingeniously divides the 10 by 10 ft. shaft into two compartments of equal dimensions, placing a timber at one side of the excavation reaching from wall to wall, and another across the centre parallel with the first. These timbers are put in like horizontal stulls; one compartment to be used for pump and ladder-way, the other for two skips



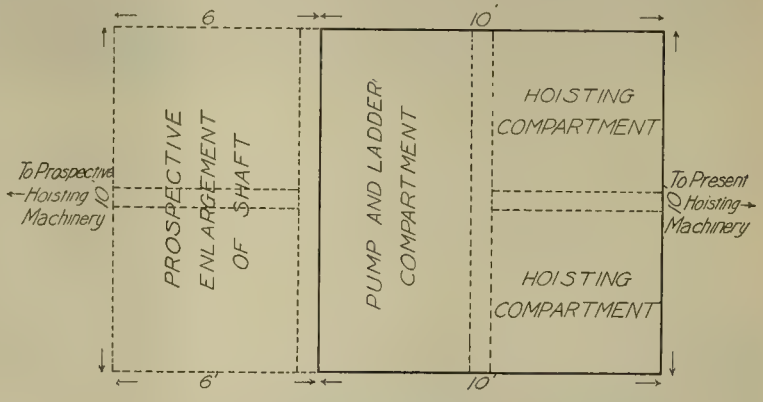


Manager's Proposal.

easily doubled with proper hoisting machinery. The pump compartment would then be 10 ft. by 4 ft. 8 in., but that compartment should also be provided with a similar steel wall-plate at the opposite side, for support of pump-columns, sinking pump hangers, platforms and ladders.

John Ross, Jr., favors the rectangular 5 by 16 ft. shaft, but believes the shaft should be fully timbered with shaft-sets. His experience has been largely with heavy ground and he considers substantial timbering imperative. He also points out the difficulties in the way of accurately placing shaft-timbers like stulls, and the dangers arising from their getting out of alignment. Mr. Ross also cites an instance where he sunk a shaft 8 by 20 ft., outside dimensions, with an average of 18 holes per round — six for the cut, and a double row of three each at the ends back of the cut. In his opinion the first cost of a shaft should be given less consideration than the cost of operation after the shaft has been completed.

R. Gilman Brown states clearly that in his opinion the 10 by 10 ft. shaft should be utilized, and does not favor changing its shape to 5 by 16 ft. or otherwise, except possibly, to enlarge it to 10 by 12 ft. He also insists that the shaft be provided with end plates and centre-piece, and that these sets be supported by posts to afford the necessary rigidity, binding the sets, and permitting a distribution of any strains taking place to a number of timbers.



Directors' Proposal.

or cages, running in guides. This plan appears entirely feasible, and as the timbers are to be solidly set in hitches they would probably give no trouble after once having been carefully placed. The exact cutting, however, of over 1,500 hitches in hard rock is no small matter. This idea, it seems, might be improved upon by setting the central timber or bunton a little nearer to one side, allowing a full five-foot width of compartment inside the guides, otherwise the two timbers and guides will take up about 20 in. of the 5 ft. allowed this compartment by Mr. Norris, to which must be added at least two inches for thickness of sides of the skip, draw-bar sides, guide-shoes, and free-running space between guides and shoes, making a total of 22 in., leaving but 3 ft. 2 in. for inside width of skip. If steel I-beams be used in place of timbers, as suggested by myself, the dimensions of which, according to Mr. Thos. H. Leggett, need not exceed four inches in width, then the space occupied by I-beams, guides, etc., may be within 16 in., which would leave 3 ft. 8 in. By shifting the centre bunton four inches to one side, as previously suggested, a full four feet could be had for interior of skip. This would admit of two skips side by side in this compartment, each having a sectional area 4.5 by 4 ft. A skip of these dimensions, six feet deep, will safely carry five tons of ordinary broken rock, necessitating but 100 trips of each skip to hoist 1,000 tons during 24 hr., which amount may be

Mr. Brown is properly opposed to sinking a deep shaft without using full shaft-sets, owing to the danger of collapse or the fall of individual members, of which there is always danger in any other than the full shaft-sets, where all timbers are inter-dependent, each forming part of a complete system. Where speed in sinking is desired, Mr. Brown thinks the rectangular shaft has the advantage, and says, "ordinarily in an oblong shaft two bars and two machine-drills are in use with two sets of drillers. This results in: an immediate gain of speed; in placing the centre-cut holes to better advantage, and in making possible mucking out one end of the shaft, setting up one machine, and then mucking out the other end, while drilling is in progress. In a 10 by 10 ft. shaft I have not found this method possible; it results in too much crowding for good work."

The east shaft of the Kennedy mine, near Jackson, Amador county, Cal., now down vertically nearly 3,000 ft., contains three compartments, each about 5 by 5 ft. It is timbered from top to bottom by an elaborate system, including 'bridges,' which were unnecessary owing to the hard ground. In this shaft three shifts worked, employing four machines on two bars. From 28 to 35 holes, five to six feet deep, constituted a round, requiring usually about 180 ft. of drilling, the rock being hard, tough meta-diabase, metamorphosed diabase-tuff, and diorite. In this formation about three feet were sunk daily. The

timber gang worked on a platform while drilling was in progress below. Whenever the full round of holes was completed, the round was blasted. In anticipation, the muckers, an entirely different set of men, were previously called, no matter at what time, day or night, and went down as soon as the air was clear enough to make it safe to venture below. Usually a few minutes after blasting, the air was better at the bottom than 50 to 100 ft. above it. In this shaft everything was made subservient to speed, no hand-drilling was done at all, all squaring up being done by machines. We know of no shaft sinking accomplished at greater speed through equally hard and tough rock, though in numerous cases the speed of sinking has been greatly exceeded under more favorable conditions.

Carl Henrich summarizes his opinion on the subject by saying, "In deciding on any particular shape for a shaft, it will be advisable to consider, in the first place, what I may call the ultimate maximum duty which the shaft may be called upon to perform, in the way of hoisting rock, water, men, tools, etc.; and in the second place, if two different shapes would serve the same purpose equally well, or approximately so, to give that shape the preference that will afford the best facilities for the work of sinking. And in this last consideration it is the facility and convenience of handling the water, which are of far greater importance than the possible saving of 15 or 20% of mucking. Any blast may bring a sudden and unexpected influx of water." Mr. Henrich is of the opinion that there is not a great difference between a shaft 10 by 10 ft. and one 5 by 16 ft. either in cost or facility of sinking, and says most engineers favor the rectangular shaft, for the reason that shafts of that shape are customary, and the real reason which brought about a discussion was the proposal to make a jog in the shaft at 320 ft. by changing the shape of the shaft from 10 by 10 ft. to 5 by 16 ft. As the jog is not customary, this raised the question, 'What is the best shape for a shaft?' In the opinion of Mr. Henrich the only important consideration favoring an oblong shaft is custom, as in his opinion anything that may be done in a 5 by 16 ft. shaft may be done equally well in one 10 by 10 ft., and concludes by remarking that in contemplating the sinking of a shaft, that shape and size should be selected which will best fulfil the requirements of each particular case.

Wilbur E. Sanders is of the opinion that the rectangular shaft is preferable because of its easy construction in the first place, and the facility with which all or any portion of it may be repaired. He suggests, however, that the 10 by 10 ft. shaft may be divided into four compartments by placing across it three 8 by 10 in. buntons, set edgewise with the shaft, and one central bunton crossing these at right angles, and considers that all the requirements mentioned by Mr. Burrows could be met in such a shaft. Mr. Sanders, in a supplementary communication, suggested the ingenious idea of dispensing with the side buntons and securing the guides to the wall by means of U-shaped brackets, the ends to be wedged tightly into holes drilled at the proper place in the walls of the shaft, thus affording two ample hoisting compartments, and two pump and ladder-way compartments. He even suggests, that by this arrangement the 10 by 10 ft. shaft might be reduced in size below 320 ft. and still be large enough for all purposes of the mine under discussion.

Summarizing: the opinion of the several engineers who have contributed to this discussion may be considered as representative of a wide range of practice in deep shaft-sinking, including the Rand, the Pennsylvania coal mines, California, Nevada, Montana, Colorado and other important mining regions. The majority of these engineers favor the oblong shafts, though several admit the possible utility of the 10 by 10 shaft by the employment of unusual methods of timbering.

One important and interesting feature is the expedient suggested to obviate, as far as possible, the use of timber in this shaft because of its expense. It certainly would be short-sighted economy to sink a vertical shaft to a depth of 2,000 ft. or more without timbering it securely from top to bottom, for without proper timbers and lagging there is a constant menace in the exposed rock-walls. It is not difficult to imagine the result of a mass of rock which may become loosened in some manner in the upper portion of the shaft, falling into the excavation, and unless men are cheaper than timbers no such risk should be taken by any mining company.

W. H. STORMS.

August 4, 1906.

Accidents in Shafts.

The Editor:

Sir — The article in your issue of July 14 on 'How bodies fall in deep vertical shafts' attracted my attention, not from the point of view which it gives, but from the point of how human bodies falling by accident into shafts are found usually stripped of all clothing. It has been my misfortune to have had two such accidents happen in mines under my control, under the following circumstances: One frosty morning at the Rarus mine, in Butte, two top-men stepped onto a water-tank at the surface, and signalled to the engineer for the 40-ft. level, which is actually 112 ft. below. The engineer lowered to about this point, when, to his surprise, he received the same signal, and immediately thereafter the cable on the reel gave a great jerk, and then snapped back, broken, into the engine-house; the two men, with the 1,000-gal. tank, had fallen to the water-level 1,550 ft. below. The tank mushroomed on striking the water, just as a leaden bullet will do on striking a wall; it destroyed the timbering and the pipe-column, so that it was about a week before the bodies were recovered; both were in the tank, and with them all, or nearly all their clothing, including their boots, but the corpses were *stripped naked*. On my expressing my surprise, I was told by the foreman and others that this is the universal result of a human body falling any great distance into a shaft.

The other accident only corroborated this in part. The victim, an Italian miner, had been gambling and had lost all his pay-check; he and his partner were eating their lunch on the station of the 700-ft. level of the mine, when after bewailing his loss, he suddenly jumped to his feet, ran to the shaft, and with a wild yell plunged over the guard-rail, and fell to the sump just below the 1,000-ft. level. His body was at once recovered, it still retained the shirt and overalls, but his boots were found, still tightly laced, beside the bare-footed body. He had fallen a little over 300 ft., and the men declared this was not far enough to complete the stripping process, but to my mind the loss of his shoes is rather a poser, if the other supposition be a true one.

Possibly some of your readers have had similar experience and can add to the evidence for or against the above theory?

JAS. W. NEILL.

Pasadena, Cal., August 14, 1906.

TO THE struggle for bare existence, which never ends, though it may be alleviated and partially disguised for a fortunate few, has succeeded the struggle to make existence intelligible and to bring the order of things into harmony with the normal sense of man, which also never ends, but, for the thinking few, becomes keener with every increase of knowledge and with every step towards the realization of a worthy ideal of life.

Mining in Transylvania.

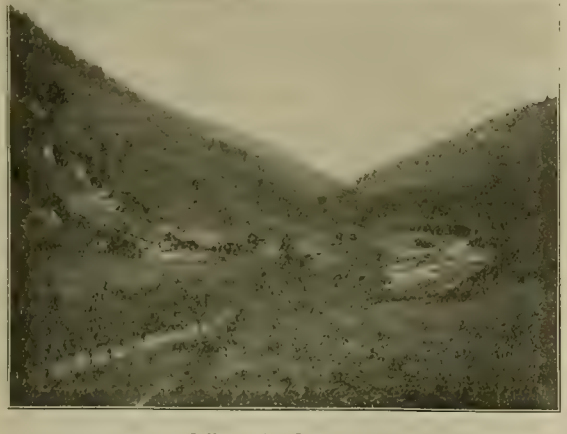
Written for the MINING AND SCIENTIFIC PRESS
BY ERNEST LEVY.

Transylvania, or Siebenburgen, is the extreme eastern portion of Austria-Hungary, and is bounded on the west and north by Hungary proper, east by Bukowina and Moldavia, and south by Walachia. It occupies 21,000 square miles surrounded on all sides by mountain chains, whereas the interior is barred and striped with lower ranges. It is only along the courses of the principal



A Roumanian House.

rivers, the Aluta, Maros and Szamos, that plains of any size are found. These mountains, which attain an altitude of 8,340 ft., may be regarded as forming the southeast group of the Carpathian system. The western portion of the mountains of this district, known as the



A Hungarian Stamp-mill.

Erzegebirge, is the ore-bearing country, as its name indicates.

The geology of the Csetras chain of mountains, with which we are chiefly concerned, is quartz andesite or dacite and extends as an interrupted body for six to seven miles in a north and south direction. Of the various rocks associated with the dacite may be mentioned trachytes in various degrees of alteration, containing free-milling gold veins and enclosing large masses of normal sandstone and conglomerate. In the neighborhood of this occurrence is found a cup-shaped deposit of altered trachyte known as greenstone measuring at the surface 3,000 ft. long and 1,800 ft. broad, and in this free-milling gold and gold telluride veins of great value occur; so numerous are these that they might be classed under the heading of 'stockwerks,' although it has been considered best to mine them individually. Further to the north, intrusions of amphibole, andesite, and melaphyre are much in evidence and play an important part as ore-producing ground. They contain rich fissure veins and appear to be factors in the formation of auriferous and argentiferous brecciated contact masses. The dacite itself may also be credited with the production of profitable veins.

Transylvania abounds in mineral springs of all kinds, more especially such as are saline and chalybeate. Hills largely formed of pure salt are met with here and there,



A Gang of Mine Samplers.

and there are also rich subterranean deposits of salt which in some cases crop out at the surface. Some of the saline springs also yield salt enough to render their evaporation profitable. Coal occurs in considerable abundance, but a superabundance of timber has retarded the exploit-



Porkura, Hungary.

ation of it. Deposits of iron are also found. The forests consist mostly of oak, elm, beech, and ash. River washing has also been a source of livelihood to some of the inhabitants.

In the Erzegebirge, the orebodies occur in different forms, including fissure veins, shear-zones, stockwerks, brecciated contact masses, and beds of auriferous conglomerate. Zinc, copper, lead, silver, and gold constitute the valuable metals, although gold has been the chief attraction. The metals occur in the form of blende, chalcopyrite, tetrahedrite, bornite, galena, silver glance, sylvanite, krennerite, nagyagite, native gold, etc. Evidence of the value of the ores is found in the shape of old dumps,

old mills and old smelters, as well as by exploitation, exploration and ore treatment now in progress.

The age of mining here dates back to Roman times; some of the ancient mines still give employment and profit; others are of much later date. One of the present largest and main producers owes its existence to an accidental discovery of ore by a peasant about 160 years ago, and now has 270 kilometres of workings.

To give an idea of the size and results achieved in some of the properties now being worked, a short consideration of actual figures obtained from two of these will suffice. During the last few years several men of the energetic and go-ahead type have proved that there is considerable gain to be made from many of the low-grade deposits, and there are good chances of many more of these being found. At one time it was considered beneath the dignity of a manager to do more than grace the property with his presence and receive the salutations of all his subordinates. Energy devoted to such adornments as spotless kid gloves and spick and span uniforms is now generally consumed in the more immediate work of real supervision.

As instances of paying mines, the following may be cited:

No. 1. This is a gold mine where the ore is found in veins up to four metres wide. During the twenty years ending 1903, the tonnage has regularly increased each year; simultaneously, the costs have gradually decreased until they have reached a very low figure. Occasionally, specimen ore is found and is treated apart from the rest. During the period under review a total of 1,235,833 tons were stamped. The ore production rose from 5,855 tons in 1884 to 157,803 tons in 1903; costs went down from $6.90 to $1.97 per ton.

The tonnage quoted yielded:

	Kilo.
Bullion	7,403.219
Specimens	4,778.239
Concentrate	410.549
Total	12,592.007

The bullion is 650 fine.

The average assay-value therefore has been 4.42 dwt. gold and 2.38 dwt. silver per ton. In the year 1902–3, the assay-value was 4.18 dwt. gold-silver bullion, 650 fine, and of this 88% or 3.68 dwt. was saved, leaving a loss of 0.5 dwt. Specimen ore increased the saving per ton by 1.35 dwt. bullion, making a total of 5.03 dwt., equivalent to a value of $3.41 per ton. The mining cost was $1.97; the profit was consequently $1.44 per ton, or a total of $227,236 for the year. In the year 1903–4 the loss of gold in the tailing has again decreased to a small fraction of a pennyweight.

No. 2. The orebodies are principally contact lodes and true-fissure veins of small width, more or less regular and continuous along the strike as well as dip. In relation to strike, two systems are known; and where these cross there is found a wide brecciated contact-mass carrying good gold ore. Treatment and dressing are accomplished in a 50-stamp mill with amalgamation plates and concentrating tables, treating 150 tons per day.

During the past ten years 322,830 tons have been mined and treated. The ore has varied in value from 8 dwt. gold and 10.8 dwt. silver to 5.8 dwt. gold and 12.2 dwt. silver during the last four years. Probably 7.7 dwt. gold and 11 dwt. silver may be taken as having been the average. The extraction has only attained figures of 63% for the gold and 20.74% for the silver. Costs have varied from $4.40 in the earlier years to $2.68 in later ones and averaged during the period under consideration $2.86, which includes development and preparation, mining and extraction, aerial ropeway (1.2 kilometres), haulage, milling and concentration, and general and realization costs. The average profit per ton has therefore been 67.4c. per ton.

The method of acquiring land is to apply to the Government for prospecting rights over one or more areas (treischurf) which are circular in shape, and comprise 202,887 square metres for gold prospecting and 566,948 sq. m. for other metals. On proving the existence of ore on such an area, a concession may be applied for; this is rectangular in shape and embraces an area of approximately 58,000 sq. m. for gold concessions and 90,000 sq. m. for other metals.

The population of Transylvania is over 2,000,000, the greater number of whom consists of Roumanians and Walachians. Labor is cheap and varies from 0.8 to 2.4 *kronen* (5 kronen being equal to one American dollar). A mine-foreman is paid about 120 kronen per month. Many nationalities are found among the miners—Roumanians, Germans, Austrians, Hungarians and Italians. The Italians seem to do the best work and the Roumanians the poorest; the last mentioned as a rule are a lazy and unintelligent class who live almost wholly on maize and liberal supplies of a sort of gin made from damsons which saps their intelligence. The lower class population as a whole is priest-ridden; in consequence operations proceed in a satisfactory manner if a little tact be displayed on the part of the managements in regard to the feelings of those who take charge of the men's spiritual welfare.

Owing to the scarcity of employment, the Government is solicitous for the welfare of the workmen. Government schools will provide the more intelligent miners with courses in mathematics and elements of geology, assaying and surveying. A workman's Compensation Act necessitates the laying by of a sum of money equivalent to two per cent of the pay-roll by the owners for the benefit of the employees in cases of distress, and to this may be added a similar sum deducted from the men's wages. Further, an elaborate form of brotherhood has been introduced in certain cases. By the use of miners' permits (certificates filled by the manager of each successive company with which a man has worked) showing the character, length of employment, etc., of the bearer, both master and man share a benefit.

Smelting is performed at Government works. Certain treatment charges are made, but these are intended only to be sufficient to cover the working costs of such treatment, and when the smelters show a profit at the end of the year, this is apportioned between the contributing mine-owners in proportion to the total value of their ore smelted. The railways which intersect the country are also owned by the Government.

IN Chota-Nagpur and Sambhalpur, two provinces of India, diamonds are found in river-beds, from which they are obtained by some of the low-caste tribes. After a rainy season, the Mahanadi river near the town of Sambhalpur becoming low, a large number of these tribes begin to dam the north channel of the river between an island and the bank. Later, when the river gets still lower, the gravel included in this dam is collected and carried to a dry, flat place, where it is washed for gold and diamonds. The quantity of gold obtained is very small, and may be barely enough to pay for the daily meals of one person, but sometimes the washers are rewarded by the find of a good-sized diamond, which may keep a family in ease and comfort for years. The diamonds found in this river-bed have evidently been brought down from a higher source, perhaps from the headwaters of the Mahanadi river, and a thoroughly equipped prospecting expedition possibly would find the matrix bearing the diamonds.

ARGUMENTS concerning the workings of nature usually regard nature as formerly parsimonious of time and prodigal of violence.

Cyanide Practice With the Moore Filter.---I.

Written for the MINING AND SCIENTIFIC PRESS
By R. GILMAN BROWN.

The plant, of which the following is a description, was designed, erected and brought to satisfactory operation during the years 1904–5. Much of the burden of the preliminary investigation and construction fell naturally upon the shoulders of Mr. Theodore J. Hoover, superintendent of the company, for which the writer was general manager. During the progress of the work a large mass of data, experimental and practical, was collected, which the two of us had planned to collate and publish in collaboration. This was all lost in the San Francisco fire. This paper and drawings have been prepared, largely from memory, but with the valuable assistance of the private notes of Mr. E. H. Nutter, who from his position as mechanical engineer and later superintendent for the Standard Co., had been fully in touch with the plant from the first.

Ever since the installation, in the early '90s, of the first cyanide plant at the Standard mine, at Bodie, California, under the initiative of Mr. Thos. H. Leggett, the treatment of the slime has been a problem of growing importance. The earliest practical attempt to solve it was in the nature of an evasion; namely, to break the caked slime from the ponds with a disc-harrow and mix it with sand. Apart from the cost, which came to an additional 30c. or more per ton on the whole tonnage, including the sand, the coarse material was only sufficient for the dilution of a portion of the slime product. Besides, this method took no advantage of the fact that by agitation the slime would yield a higher extraction in a shorter period. For want of a better way, the practice was continued for a time, as the only way of preventing the congestion of the tailing ponds with untreatable slime. But active experiments were made in other directions.

Agitation and decantation were discarded because of the flocculent character of much of the slime, that would not settle in 72 hr. to over 15% solids. Filter-pressing was tried and abandoned, because an eighth of an inch of pure slime would make the cloths impervious, even under 120-lb. pressure; and even if the slime was mixed with fine sand, the filtering was so slow that the sand settled out in the chambers, with the same result.

Dehydration of dry slime by roasting made both filtering and decantation possible, but with lower extraction and high cost; moreover, it was not applicable to the direct treatment of the wet product from a stamp-mill. More than one method of filtration in vats during agitation was tried and discarded. In the summer of 1903 the first crude tests with the Moore method were made, with no brilliant results. Later a personal investigation of the plant at Mercur made clear the inherent advantages of the method, while at the same time it exposed certain mechanical deficiencies. An experimental plant of half a ton capacity was installed at Bodie and from the first the results were good. Such was our success that by the middle of the winter we decided to apply it to all the tailing from the Standard mill. In designing the plant every care was taken to avoid the defects of the Mercur plant, but notwithstanding this, several months were consumed, after the plant was nominally completed, in alteration and modification, the major part, let it be noted, being in details outside of the Moore process proper. By the middle of 1905 operations had become fairly regular and the profit for the whole year amounted to more than half the cost of the plant.

The ore consists of quartz, iron oxides and clay, the last coming from the decomposition of feldspar in the country rock. At times this equals 50% of the ore and as an average can be taken at 33⅓%. The gold is partly coarse and partly very fine, the latter portion amalgamating badly, to such an extent that at any time fine colors can be panned from below the vanners. The proportion of silver is high, the mill bullion being worth only $10 to $12 per ounce. Altogether it is a difficult ore to treat, despite the total absence of all minerals ordinarily classed as deleterious.

In conjunction with the introduction of the Moore method weak cyanide solution was substituted for water in the 20-stamp mill and the grade of the plates was increased from 1½ in. to 2½ in. per foot, in order to cut down the proportion of liquid to keep the plates clear. This steep grade, in conjunction with the hardening effect of the cyanide solution on amalgam, has diminished the extraction by free milling from 60 to 50%. After considerable experiment the strength of cyanide solution was settled at two pounds per ton, and with this at first no trouble was experienced with the plates, but of late the lower ones, where the amalgam lies thinnest, have shown signs of wasting, and some have been renewed. Possibly this can be lessened by using Muntz metal or by carrying a heavier coating of amalgam. Lime, at the rate of 10 lb. per ton, is added to the ore before it goes to the crusher. After passing over vanners, the pulp is raised 63 ft. to the high-level flume for conveyance to the slime-plant, 1,800 ft. away. The elevation is done by four Frenier sand-pumps, in series. The three lower ones, 10 by 54 in., have a lift of 16 ft. 4 in. each; the upper one is 8 by 48 in., and has a lift of 14 ft. The high-level flume is four inches wide and nine inches deep, set on a grade of 7/16 in. per ft.; the pulp carries 17 to 19% solids and at this grade it flows freely under all conditions of temperature. A grade of 5/16 in. was found insufficient, particularly in cold weather; a broader flume was also found to give trouble by accumulations of sand. When received at the slime-plant, the pulp is again raised by a centrifugal pump to the cone-separators. A word regarding the two methods of handling pulp: The Frenier pump, for a regular flow and for lifts within its capacity, is most satisfactory; the consumption of power is nominal and the wear is confined to the stuffing-box at the discharge; however, it requires more attention in operation, particularly in starting or stopping, and a great deal of pains in erecting.

The re-grinding is done in a 5 by 22 ft. trunnion tube-mill of Allis-Chalmers make. The feed is from the underflow of two cone-separators. These are of wood, approximately five feet deep and with 60 deg. slope of side. No extra solution is used to effect the separation, the degree of which, that is to say the proportion of overflow to underflow, being regulated by a simple needle-valve actuated by a screw and hand-wheel from the top. The routine test for separation is to catch the overflow on a 150-mesh screen and raise the needle-valve until no material is held on the screen. The underflow, containing the coarse stuff and a certain proportion of adhering slime, passes to the tube-mill, being mixed with sand and slime from the ponds, automatically fed into the stream. The outflow from the mill is returned to the cones. The mill makes 26 rev. per min. The pebbles are Greenland concretionary flints, the charge being about 12 tons, which fills the mill a short distance above the middle. This charge seems to be the best for grinding and most economical of power, but the difference is not great and the charge can wear to half this quantity with small diminution of grinding. The attempt was early made to use selected pebbles from local glacial drift, but their irregularity prevented free motion, and gave a high wear of liners, with increased power consumption. The insufficient hardness also of the pebbles made them expensive.

The linings originally furnished were of white cast iron, secured in place only by the arch of the shell. They

were a constant source of trouble from dropping, and their life was short. Soft-wood blocks on end, six inches long, were next tried. There was no diminution of the grinding, but besides their short life—of about 10 days—they introduced an unexpected element in excessive foaming of all the solutions. It was assumed that this was due to a saponification of the wood oils by the alkali in the solution. But whatever the cause, it produced an overwhelming mass of suds, overflowing all the launders and covering the vats with 18 in. to 2 ft. of foam. Mountain mahogany was tried next, diminishing this trouble, but with scarcely a longer life. Silex was subsequently used, and for a time answered well, but when partly worn there was continual delay from replacing worn-out blocks. This objection was entirely aside from the delay of four weeks or more demanded for the full setting of the cement that held the lining in place. The continuation of the use of silex meant the addition of a second tube-mill, that is, the duplication of the re-grinding plant.

Finally, the practice settled down to wrought-iron plates for liners. These are ⅜ in. by 8 in., cut into 7 and 15 ft. lengths and bolted through the shell. Some of the plates of this lining would be worn through in 90 days, but by replacing these the average life came to over 100 days and the duty to 4,800 tons of sand, ground to 200 mesh. The consumption of pebbles was 15½ tons; reducing this to pounds per ton, the lining wear was 2.44 lb. and the pebble consumption 6.47 lb. It seems likely that the wear of lining and pebbles is rather a function of time than of tonnage and in any case it is certain that the rate of wear of lining at least is much affected by the manipulation and proportion of solid in the feed; so that this somewhat anomalous success with the softer lining is probably in a measure due to the increased skill in adjusting the feed to the mill. It is to be noted as a point in favor of the wrought iron that there is little waste, as it can be worn down thin without breaking. Aside from this, the ease of inserting and securing the straps—all of which can be accomplished in 10 hr.—was the determining argument for their final adoption. The power for the mill is approximated as 50 h.p. when running and 100 h.p. at starting. The maximum grinding capacity of the single unit has not been definitely reached, but it is safe to place it at 60 tons of sand per 24 hr. This makes the duty of a horsepower month 36 tons. At normal cost of electric power in California the power cost comes to 17c. per ton; at the Standard mine, which produces its own power, the cost is 5½c. An interesting comparison can here be made between the cost in power of stamping from 2½ in. size to 30-mesh and grinding from 30-mesh to 200. The consumption of power in the Standard mill of 1,000-lb. stamps is, for stamping alone, 28 h.p. The monthly tonnage is 1,800, so that the duty of one horsepower-month is 64 tons. The reduction of linear size from 2½ in. to 30-mesh is given in the ratio 25:0.025 or 100:1. For the tube-mill the ratio between feed and product is 0.025:0.001 or 25:1. Summarizing: One horsepower in the stamp-mill reduces 64 tons per month at a ratio of 100:1, and in the tube-mill 36 tons, at 25:1. These figures are, for several reasons, far from accurate, but they serve to show in a sketchy fashion the largely increased power cost of fine-grinding. In connection with the recent notes* of Mr. Butters on the necessity of heavy foundations for the tube-mill, it is interesting to note that the foundations at the Standard are piers of heavy timbers, tied and bolted together with heavy angle pieces of ⅜ by 8 in. flat iron and carefully bedded on mud-sills set in hardpan. Mr. Nutter tells me that after nearly a year's use, these were tested with a transit and found unmoved. As a final comment upon the tube-mill, it can be said that it has proved itself a highly efficient fine-grinding machine, but that when the whole plant depends upon a single unit, as in this case, any accident to it shuts down the whole plant. This virtually demands the duplicating of the entire tube-mill equipment—for a small plant, a heavy extra capital expense. This led to experiment with a modified pan for fine-grinding. It was found that a single five-foot pan had a capacity of about five tons per 24 hr. and consumed 10 h.p. or from eight to nine pans were required to handle the coarse product of 20 stamps, at a marked increase of power-cost. No determination was made of wear of metal, but judging from experience with grinding concentrate it would be high, and probably the labor of attending to a battery of pans would be large. Altogether for a small plant, so far as this experience goes, three smaller tube-mills, any two of which could do the whole work, would be preferable to pans, and probably cheaper in installation than two large units.

The percent of solids has been increased in the tube-mill discharge to 25%, or perhaps higher, by the addition of material from the ponds. The settling vats, of which there are nine, aggregate a capacity of 21,000 cu. ft.; they are flat-bottomed wooden vats in two sizes of 70 and 80 tons solution capacity, representing 2,200 and 2,550 cu. ft. respectively. On the basis of inflow of 400 cu. ft. per hour, the one size fills in 5.5 hr. and the other in 6.4 hr. While filling they are agitated, then allowed to settle 28 hr. and slowly decanted down to the upper surface of the slime. This occupies eight hours and two more hours are taken to mix and pump out the sludge, a total of about 43 hr. Forty-two per cent of the solution is recovered by decantation. It passes to an additional clarifying tank and then to the gold tanks. The remaining pulp carries from 34 to 40% solids. Returning to the mechanical details of the settling room: the agitators are drags, actuated by a vertical shaft, driven by overhead crown gearing, but stepped on a steel button, running in quicksilver, on the floor of the tank. Above any level at which the heavier pulp can collect, an 8 by 8 in. cross-arm is secured to the shaft and from this the drags hang by links or short chains. The drags are short lengths of 30-lb. T rail; the speed of seven or eight r.p.m. is ample and the power consumption is low. This drag type of agitator is essential, as otherwise the slime packing around the blades would stall the driving gear. After decantation, the pulp is made homogeneous by stirring with the drags and then transferred to the storage or treatment vats by centrifugal pump or air-lift, both devices being used. For decantation there are hinged pipes that are lowered into the vat, after the requisite clearness is attained and that can be kept near the surface so as to draw off the least turbid solution. These discharge through the sides of the vat a short distance above the bottom. The sludge is drawn off through pipes in the bottom.

*MINING AND SCIENTIFIC PRESS, May 26, 1906.

FOR many years the New Chum Railway mine has been the deepest on the Bendigo goldfield. Both the New Chum Railway and the Victoria Quartz companies have been sinking to a depth of 4,300 ft., and the other day the Victoria Quartz wrested from the New Chum Railway its distinction of being the deepest mine. The sinking of the New Chum Railway's shaft has been hampered by heavy water, and recent measurements showed that, while that company was down 4,242 ft., the depth of the Victoria Quartz was 4,255 ft.—*Queensland Government Mining Journal.*

THE gold mines of Western Australia have yielded gold to the value of $323,833,227, and they have paid dividends amounting to $70,520,910.

The Application of the Pohle-Croasdale Process.

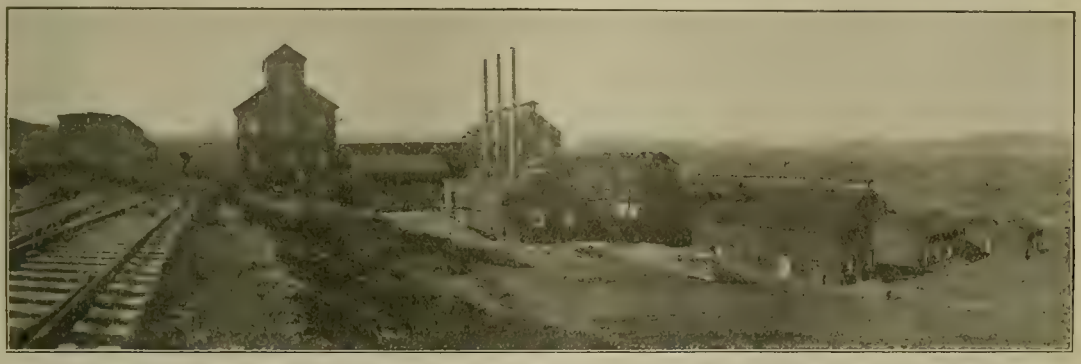
Written for the MINING AND SCIENTIFIC PRESS
By O. H. FAIRCHILD.

The Rigby Mining & Reduction Co. has recently put into commission its new plant, at Mayer, Yavapai county, Arizona. This is interesting as the first attempt on a commercial scale to employ the Pohle-Croasdale volatilization process.

The ore is unloaded directly from the railroad car to a steel-covered crusher-floor in the sampler, which is a building 36 by 38 ft., four stories high. From here, it is fed into a Blake crusher. From the crusher, chutes lead into a 62 ft. elevator, which carries the ore to the top of the sampler. Here, all material passes into a 60 in. by 10 ft. hexagonal screen, the undersize passing thence into a double-cut Vezin sampler, which takes one twenty-fifth, the oversize being deposited in a belt-conveyor 16 in. wide by 135 ft., which feeds it to ore-bins, each having a capacity of 150 tons. The oversize from the screen goes to a pair of Allis-Chalmers rolls, where it is crushed, the product going to the elevator that takes the ore from the crusher.

From the bins the ore is taken in a car to a hopper in the dryer-room, which is a building 30 ft. by 56 ft. From the hopper the ore is removed by an elevator to the dryers. The smaller of these is 44 in. at the large end by 18 ft. long; the large dryer is 60 in. at the large end by 26 ft. long; it has four compartments, the compartments and shells both being made of wrought iron. The ore is dumped from these dryers into brick bins from which it is drawn into a car on a track sunk eight feet below the floor of the dryer-room, this track running into the lower part of the roll-house, which is 30 ft. by 56 ft., three stories high. The track from the dryer-room runs over the tops of four hoppers, in the bottom of which are screw-feeds actuated by an independent counter-shaft. After the ore is dumped into these hoppers it is fed into the bottoms of four elevators that deliver it to the screens in the top story of the building. The ore which passes the 20-mesh cloth, covering the 50 in. by 8 ft. conical screens, is deposited on a 16 in. by 84 ft. belt-conveyor and carried to an iron pulp-bin in the mixer-house. The oversize goes to three 30 in. by 14 in. rolls and one 20 in. by 13 in. roll, the latter being used largely for crushing salt. After being crushed, it returns to the hoppers which receive the ore from the dryer, whence it goes again to the screens. There is a dust-collecting system of three No. 39 Prinz & Rau machines with their fans and the necessary galvanized pipes which are connected with all dust-producing parts of the machinery, the dust that is collected being deposited directly on the 16 in. belt-conveyor, which takes it to the pulp-bin. The 20 in. by 12 in. roll, which crushes the salt, has an independent bin in which the salt is deposited and from which it is carried to a bin in the mixer-house. This is a building 64 ft. long, 14 ft. wide and 34 ft. high. It contains an iron ore-bin of 30 tons capacity, in which the finished ore from the roll-house is deposited, and a salt-bin of five tons capacity, in which the salt is stored. Under each of these bins is placed a hopper-scale, the one under the ore-bin being capable of weighing four tons; the one under the salt-bin has a capacity of 1,500 lb. On both of these scales are sheet-iron hoppers to receive the product from the bins above them. Running under these hoppers is a 16 in. by 52 ft. belt-conveyor, which rises at an inclination of about 30 deg. and deposits its material in a bin that holds six tons. Underneath this storage-bin is a box-mixer of four tons capacity. Underneath that is a storage-hopper of six tons capacity.

The material for a charge is drawn from the salt and ore-bins, in proportionate amount, into the scale-hoppers, where it is accurately weighed. The valve-gates are then opened and the ore and salt are fed in a stream to the belt-conveyor and deposited in the 6-ton hopper over the mixer. This is a square box made of sheet steel, something after the pattern of a cement-mixer. The mixer is then rotated until the salt and ore have been thoroughly mingled, and is then dumped into the lower 6-ton hopper ready to go to the furnaces. From this hopper it is taken to the furnace-house in a bottom-dump car. At the feed end of each furnace is a five-ton sheet-iron hopper with a screw-feed in the bottom. This screw-feed furnishes a continuous stream of ore and salt to a pipe running into the furnace. The furnaces are wrought-iron cylinders with half-inch shells, 5 ft. 6 in. diam. at the feed-end and 7 ft. 6 in. inside diam. at the discharge, and 36 ft. long. They are lined with 6 in. of fire-brick and have a series of standard fire-brick projecting three inches beyond the inside surface of the lining. These serve as rabbles. The fire-box is situated at the discharge end of the furnace, while at the feed-end is a smoke-box 4 ft. by 6 ft. clear on the inside. The furnace-room is 132 ft. 8 in. long by 88 ft. wide. Four furnaces are in place, with room for three more. The ore, after treatment, is discharged at the fire-box end into a conveyor that takes it to the waste-dump. From the smoke-box a pipe 4 ft. diam. conducts the fume to the inlet collection-chamber. This is a building 98 ft. long, 30 ft. wide and 30 ft. high, one story; it contains the collection-chambers and flues for cooling the gases coming from the furnaces.



The Rigby Reduction Works at Mayer, Arizona.

These collection-chambers are of brick, 12 ft. 8 in. long by 5 ft. 2 in. wide, the inlet-chambers being 6 ft. high and the outlet 5 ft. high. Midway between them is a chamber 5 ft. square and 5 ft. high, on which rests the centre portion of the M pipe. The chambers are so built that from the inlet, where the gases are introduced by

the 4-ft. pipe from the furnace they pass through A pipe, which is 20 ft. high to the apex, rising and descending to the outlet-chamber. The gases then return to the inlet through an M pipe of equal height, then passing back from the inlet to the outlet-chamber again through another A pipe. These pipes are of 3 ft. diam. and have a total length of 200 ft.; they are built of sheet steel; they are so constructed and placed that any precipitation of fume falls into the collection-chambers, frem which they are removed through suitable doors. From the outlet, the fumes pass thraugh a 20 in. sheet-iron pipe to a Root blower. Passing through this blower, they are forced through a 20 in. pipe into the condensing-chambers. These are in a building 96 ft. long by 44 ft. wide. One half of it is 28 ft. high; the other half, containing the bag-houses, is 40 ft. high. These condensing-chambers are 21 ft. by 16 ft., and are built 6 ft. high of brick. They are plastered on sides and bottom with smooth cement. At the height of six feet from the floor is a sheet-iron floor, which contains apertures for fifty-four 18 in. flannel bags 30 ft. long. The sides of these houses, above the brickwork are built of 2 in. by 6 in. studding and lined with first-class clear flooring. The material obtained in the collection-chambers, condensing-chambers, and bag-houses are taken to the filter-house, where the copper is separated. This filter-house is 30 ft. by 56 ft., 24 ft. high. From here the solution goes to the precipitation-house, which is a building 55 ft. 4 in. wide, 42 ft. long, 23 ft. high. This building contains tanks for the precipitation of the copper, which is the only commercial metal contained in the solution.

The chemical principles upon which the operation of the process is based is the fact that many of the metals can be volatilized when heated in a current of chlorine gas or hydrochloric acid. These ores are crushed dry, mixed with salt, and then subjected to an oxidizing atmosphere of 1,000 deg. C. or above. The chemical equation

$$2NaCl + S + 2O_2 = Na_2SO_4 + Cl_2$$

shows the necessity of sulphur. The amount of chlorine must, for obvious reasons, exceed the theoretical amount required to chloridize the volatile metals. Consequently the percentage of salt to be added will exceed the theoretical, and must be determined by trial. With an average ore the limits may be placed at from 5 to 12% salt but with higher lead and copper contents, even more will be required to volatilize these metals. The relative amount of salt to sulphur as expressed by the above equation is 10% salt to 2.3% sulphur. In practical tests it was determined that, with sulphur much in excess of 3%, preliminary roasting is needed to remove that excess. Otherwise an unnecessary amount of salt will be consumed. Mr. Stewart Croasdale finds that 50 or 60 min. will volatilize the gold contents of an ore with a furnace temperature of 1,000 deg. C., or above. The gold volatilizes as a chloride or possibly as a double chloride with sodium, but these contents break up soon after leaving the furnace and metallic gold is deposited.

As to the volatilization of silver from its ores, much information is available from the literature of hyposulphite lixiviation which was formerly carried on at various camps in the West and in Mexico. However, as pointed out by Mr. Croasdale, his effort was to volatilize the silver to the highest degree practicable, rather than to prevent it (as the roasting of the ore by Russell's process), and his roasting was done in a highly oxidizing atmosphere. Under the latter conditions the silver volatilizes probably more easily and completely than gold, and the silver sublimate is deposited in the dust-chambers or bags as a chloride or sub-chloride. This sublimate, of course, is insoluble in water or dilute acids, a fact which favors the separation of copper from the silver and gold products in the final clean-up.

The lead volatilizes readily and the sublimate is found to be a mixture of both the chloride and sulphide salts. The copper contents of the ore also volatilize readily but the time required is usually two or three hours, if a considerable amount of copper is present. The sublimed copper is composed of cupric, cuprous and oxy-chlorides principally. Zinc compounds volatilize very imperfectly, so that 50 to 70% of the original zinc is left in the residue. Arsenic, antimony and bismuth would be expected to follow the lead, silver, etc., but iron, nickel and cobalt, especially the former, should volatilize to a certain extent. The behavior of nickel and cobalt has not been definitely determined, but these elements appear to behave much like zinc.

From the description of the mill it will be noted that the crushing and preparation of the ore is similar to that employed by most dry-crushing plants. The ore is reduced to a 20-mesh product, mixed with salt as described, and fed automatically to the furnaces. From this point the plant consists of units, each one being independent and consisting of a furnace, a set of collecting chambers, and cooling flues, a blower, with its connecting pipes, a condensing-chamber and a bag-house. There is no stack to these furnaces, the draft being caused by the vacuum created by the blowers. All gases are drawn into the condensing-chambers and bag-house. The precipitate or flue-dust is taken to the filter-house and treated in leaching tanks for separation of the copper content, the remaining residue being subsequently refined.

The plant has a capacity at present of 125 tons per day; this can be readily increased, the works having been designed to that purpose.

THE SEISMOGRAPH.—In its simplest form an earthquake indicator might be a tray with notched edges so filled with mercury that a shaking of the earth would cause an overflow in the direction of the movement. In the instrument used by science the pendulum is employed, vertical by some Italians, horizontal by the Japanese, English, most European and American observers. A movement of the earth affects everything but the pendulum, which is so freely hung as to remain stationary, and a recording device makes the result visible. Of old with the vertical pendulum a sharp point drew the profile of the movements on a blackened surface. Photographic paper in moving strips serves the modern instruments. The horizontal pendulum turns on a vertical axis and carries at its extremity a heavy weight which earth shock does not reach. In the Milne seismograph a platinum sheet attached to this weight has a slit intersecting at right angles a slit in a second sheet underneath. In times of quiet reflected light passing through both slits makes one point and prints a straight line on the moving bromide paper. When the earth shakes the lower slit moves and the line becomes crooked, according to the strength of the shock. A clockwork arrangement with shutters and a light times the disturbance. The instruments are so delicate as sometimes to indicate shocks which no men have felt.

THE independent oil producers of Texas and Kansas have combined interests for the construction of an eight-inch pipe-line from or near Chanute, Kan., to Port Arthur, by way of Indian Territory, a distance of 650 miles. The steady decline in production of the Texas-Louisiana fields and the rapid increase in demand for the crude oil for refining purposes prompts this project. Kansas and Indian Territory fields are producing a surplus of the grade of refined oils which will supply the independent refiners of Texas and create a market with which to compete with the Standard.

Cyanide Notes.

Written for the MINING AND SCIENTIFIC PRESS
By E. A. H. TAVS.

Successful cyaniding depends on two things: A working knowledge of the process, and common sense. A certain treatment may be successful at one camp and fail at another; in fact, the treatment successful with ore from one level of a mine, may fail with the ore from another level of the same mine. Consequently, to be successful, the cyanider must be ever alert.

Another thing he must bear in mind, and that is, never to despise future possibilities. I call to mind a personal experience. We were treating with fair success, a refractory lot of tailing of high value, and because the mill-tailing was a little poorer than that from the cyanide plant, we ran all of it down the arroyo, as being worthless to us. Five years later, at the same plant, I treated, at a profit, tailing carrying but one-half the values of that which ran into waste five years before.

We all recognize that oxidation of the charge during treatment is desirable in securing high extraction; but, so far, no economical method of obtaining this condition has been devised. I refer to the leaching of ordinary sand charges, for the agitated charges of slime are readily oxidized. It is generally conceded that in a vat charged with sand, when drained, the charge is affected bp the oxygen of the atmosphere to a depth of but a foot or two below the surface. From experiments and accidental discoveries, I am led to believe that such charges are affected to, or nearly to, the bottom; time being the only essential.

I call to mind a small plant treating from 800 to 1,000 tons per month, it being an old plant remodeled. The material treated was a tailing from a stamp-mill, consisting of at least 25% clay slime; and, at best, only 80% could be extracted from it. It should have been arranged to separate the slime from the sand, in order to treat each separately, and this could have been done economically; but, as the plant was working to good advantage, it was deemed best to make no change. The treatment was designed to discharge one vat (about 36 tons) per day, and as there were ten vats, each vat was given a ten days' treatment, although the engineer told me, in turning over the plant, that full extraction was made in seven days. After a month or two some experiments were made, and it was found that as good results as could be obtained from the material treated could be obtained in five days; and, of course, after verifying these results, it was decided to double the output, as this increased the running expenses but little.

While we were waiting for extra supplies (two months) the five-day system was installed, and practice upheld the experiments, as long as we had an excess of vat capacity. When everything was ready to double the output, and every vat was put regularly into commission, our extraction dropped off from 6 to 8% and continued low all one month, before the trouble was detected.

The treatment was as follows:

1.	Charge vat with sand	8 hours
2.	Charge strong solution (0.2%) from below, valve half open, and let soak	14 "
3.	Discharge, valve wide open, until solution titrated 0.1%, then charge weak solution (0.1%) on top and let run	12 "
4.	Charge allowed to drain	12 "
5.	Strong solution charged from above, until vat filled, when valve was opened, and when the escaping solution titrated, 0.1%, weak solution was run on six hours	12 "
6.	Charge allowed to drain	18 "
7.	Strong solution charged (from above) until full, and left to saturate	6 "
8.	Solution drained off and when titrating 0.1%, weak solution was fed on top, feeding and draining at same time	12 "
9.	Let drain two hours, when seven tons fresh water were run on from top and charge let drain	18 "
10.	Sample and discharge tailing	8 "
	Total	120 hours

This treatment gave us good results in five days, during full charge experiments, when we had extra vats; but when all the vats were put into commission, as already stated, the extraction dropped as much as eight per cent.

In going over the treatment step by step, everything checked up to the ninth step. It was found that while our scheme called for the treatment indicated, when we had vats to spare, the boys let the charge drain (oxidize, in fact), up to within the 14 hours necessary to fill the water-wash and drain dry enough to discharge, the vats remaining dry about four days before the water-wash was run on. This long period of rest allowed the latent reaction of oxidation to develop fully, and when the water was run on it readily took into solution the dissolved metals still in the tailing.

After this discovery, the treatment was modified, as follows:

1.	Charge vats with material	10 hours
2.	Charge strong solution (0.2%) from below at one-half valve capacity, and let soak	14 "
3.	Discharge solution, valve wide open, and at end of second hour, feed (on top) weak solution (0.1%); valve half open	12 "
4.	Let charge drain, valve wide open	12 "
5.	Charge strong solution from top, and let soak	6 "
6.	Discharge, valve wide open, and at end of second hour, charge (on top) weak solution; valve half open	12 "
7.	Let charge drain	18 "
8.	Charge weak solution from top, valve wide open, and let soak	6 "
9.	Let charge drain, and oxidize	62 "
10.	Charge fresh water from top, until vat fills, and let soak	3 "
11.	Open valve wide, letting charge drain; this wash going to storage-vat leading to zinc-boxes	13 "
12.	Sample, and discharge tailing	12 "
	Total	180 hours

This treatment gave good normal results; and, as a charge was run through in 7½ days, it still gave us a total of 1,500 tons per month, instead of 1,000 tons under former treatment.

I firmly believe now that oxidation takes place clear to the bottom of a vat full of sand, the vat having been filled with water and this then allowed to drain off, from the bottom. When full of water, the interstices are occupied by the water, the sand settling and packing as close as possible. As the water drains off, these interstices empty and form a vacuum, which naturally fills with air; the pressure of this being ample to fill the lower voids, as the water recedes. Once the interstices are filled with air, the chemical reactions that take place cause a practical oxidation to set in, if time be allowed; and it is probable that 80% of this reaction takes place within 60 hours. That the interstices in the charge do fill with air is proved by the fact that in running water on to a charge, much ebullition takes place, and for half an hour or more after the charge is covered with water; many air-holes forming all over the top of the charge.

Another proof that chemical reaction takes place in a charge treated as outlined, and then left to drain three or four days, is (from my own tests) that if a water-wash be run through immediately, it will show but a few cents per ton; whereas, if the water-wash be run through several days after the charge has been allowed to drain, it will carry from $1.50 to $2 per ton.

Several years ago I discovered that newly turned zinc, if the shavings where stored were exposed to air, was necessary for perfect precipitation. Later, I have learned that solutions running through the zinc-boxes should not be too strong in cyanide, if a product high in the precious metals be desired. When the solutions run 0.1% or over, the reaction set up is so violent, that a larger proportion of zinc is destroyed (oxidized) than is necessary; the resulting slime (auro-cyanide) being low in gold and silver and high in zinc.

With weak solutions the reaction is normal, and metallic zinc is destroyed in proportion to the values in the solution; and the resultant slime is high grade. I have secured slime running $30,000 per ton and high in zinc, requiring acid treatment; whereas, the next month, on the same grade of ore, slime, low in zinc, requiring no

acid treatment, and carrying $57,000 gold per ton, was obtained, simply by not allowing the solutions to get beyond a certain strength, say, 0.05%. For this reason, my practice has been, of late years, to run all solutions and water-washes into a common vat, the mixed solutions from which are run to the zinc-boxes. When the solution is above 0.05% in cyanide, it can be run through



Flood-gate. Presa de Los Santos.

the zinc-boxes a little slower; and when below 0.05%, a little faster, to obtain the normal results. Should the solution be very low in cyanide, say 0.01%, and yet rich in metals, a little cyanide can be added to the head box in each row, if it is found that solutions of 0.01% strength do not precipitate normally.

In the clean-up it is good practice to return all zinc, staying on a 40-mesh screen, to the precipitating-boxes. This zinc should be kept covered with a weak KCy solution until returned to the boxes. This prevents the violent oxidation that sets in under exposure to the atmosphere.

Architecture in Mining.

In the United States as well as in most other Anglo-Saxon countries, the suggestion of architectural adornment in connection with mine or mill-construction, only provokes derision. Our rigorous attachment to strict utility generally impels us to avoid anything that approaches adornment, leading us to model our mine and mill-buildings in studied ugliness, with outlines rarely pleasing to the eye, and often even repellant. It may not be out of place, therefore, to insinuate that a thought be occasionally given to making our mine and mill-buildings good to look at, instead of allowing them to be blots upon the face of nature.

The Mexican miners carried this idea to extremity in the other direction, as may be seen from the accompanying photographs of a mill-dam near Guanajuato, the summit of which is crowned with statues, the figures representing saints after whom the builders' children were named. This dam, called *La Presa de Los Santos*, or dam of the saints, was built in the 18th century, a tablet in the face of the construction setting forth its completion in the year 1788. Its purpose was to impound water for a *hacienda de beneficio* or mill using the *patio* process, which is still running, enjoying the distinction of being the only one in the district that has retained the old metallurgy.

Around the mines the adornment was often studied and elaborate, the retaining walls were strengthened with arched buttresses, ornamented with scrolls; the entrance to the yard consisting of a beautifully carved archway, the arch surmounted with a statue of the guardian saint, the entire edifice looking more like some old-world religious structure than anything so practical as a mine.

ONE of the recent purposes for which aluminum has been employed is in the making of grindstones, on account of the property which it possesses of forming under the whetting action a very fine mass which adheres strongly to steel. An examination under the microscope shows the edge of the steel to be perfectly uniform and unbroken, which is not the case when steel is sharpened on stone.



Back View of La Presa de Los Santos.

The Estimation of Copper in Ore and Matte.

Written for the MINING AND SCIENTIFIC PRESS
By O. H. PACKER.

Of the several well-known methods for quantitative copper analysis, the electrolytic method is undoubtedly the most accurate and will always be used for strictly high-grade work; but I find that assayers are not, as a rule, sufficiently experienced in the chemistry of electrolysis to make a success of it on all varieties of copper ore.

In order to obtain proper results by the electrolytic method, due regard must be paid to the following points:

1. A uniform voltage should be maintained throughout the determination.

2. Too high a voltage will deposit spongy copper, and zinc will be deposited if present above three per cent.

3. Stop the current when all copper is deposited and not before.

4. If the solution be too strongly acidified some copper will remain indefinitely in the solution.

5. Sulphuric acid has a tendency to deposit spongy copper, especially if much of it be present.

6. Bismuth, lead, and arsenic will be deposited with the copper.

It is evident, therefore, that the assayer must know the mineral constituents of his ore, the approximate amount of copper present and be able to remove objectionable elements. This is requiring too much of the average assayer.

The 'iodide method' is excellent, but it works satisfactorily only in the hands of fairly skilled chemists; besides, it offers no appreciable advantages over the easier method explained in detail later. In the old cyanide method (Mohr and Parkes) the ore is dissolved with acid and enough ammonia hydrate added to produce the blue color, and the solution is then titrated with a standard solution of potassium cyanide. By this plan some time is saved, by not separating the copper from the residue of ore and other metals in solution, but the results are not satisfactory, accuracy being impossible with miscellaneous ores of copper.

The 'aluminum-strip-cyanide method' is, in my opinion, the most satisfactory known at the present time for determining copper at the mine or smelter. The rules to be observed in order to secure uniform and accurate results are few and easily followed. The chief objection to this method is that, in different hands, uniformly higher or lower results will often be obtained owing to variations in manipulation practiced by different persons. Some of the variations which affect results are:

1. High temperature of solution when titrating lowers the result.

2. Large amounts of ammonia added produce higher results.

3. Large amounts of ammonia and acid added will also produce higher results.

4. The amount of copper, acid, and ammonia being the same, the more dilute the solution is, the lower will be the results.

Now, these variations in results have a tendency to neutralize each other; so that unless the chemist goes to extremes, uniform and accurate results will be obtained, especially *if the precautions given later be observed.*

This method is dependent upon the following chemical reaction:

$$CuSO_4 + 4KCN = K_2SO_4 + CuK_2(CN)_4$$

The atom of copper in the molecule of copper sulphate weighs 63 microcriths and the four molecules of potassium cyanide weigh 260.4 microcriths. [4(39.1 + 12 + 14) = 260.4]. By proportion,

63 m.c. : 260.4 m.c. :: 1 gram of Cu. : x grams of KCN

$x = 4.1$ grams of KCN.

It is evident, therefore, that if a solution of potassium cyanide be made to contain 4.1 grams of KCN to each 100 c.c. of solution and one gram of ore be taken for analysis, each cubic centimetre of potassium cyanide solution required in titration will represent 1% of copper in the ore.

As chemically pure KCN cannot be purchased in the market it is necessary for us to use the commercial article (about 98% KCN) and standardize our solution by titrating a solution of a weighed amount of chemically pure copper. The details of the various operations are as follows:

STANDARD COPPER SOLUTION.

1. Wash a little over one gram of chemically pure copper in hot moderately concentrated nitric acid. Wash several times in distilled water and finally with a little alcohol, though the alcohol wash is not absolutely necessary. Dry very slowly to prevent a coating of copper oxide.

2. Weigh out *exactly* one gram and dissolve in 25 c.c. C. P. nitric acid. Use a tall beaker and cover with a watch glass to prevent the spray falling outside (a frequent source of loss). Heat may be used.

3. Wash the solution into a litre flask and dilute to exactly one litre (= 1000 c.c.) using cold (63° F.) *distilled* water. Precaution: Do not add ammonia or any more water in *any* case. This is your *standard* and *nothing* must be added before trial samples are measured in the (dry) graduated cylinder, beaker, or burette as described later. It may be kept indefinitely for future use.

STANDARD POTASSIUM CYANIDE SOLUTION.

1. Dissolve about 42 grams of the best commercial KCN in about one litre of distilled water.

2. Decant or filter out the sediment and puss, and place in a light-proof bottle for future use. It will keep several weeks but must re-standardize very often—every day likely.

STANDARDIZING THE KCN SOLUTION.

1. Take two 100 c.c. burettes. Wash one (A) out with the standard copper solution (not with water) and the other (B) with the KCN solution (not with water). Discard washings.

2. Fill the (A) burdette with standard copper solution and run off to the zero mark. A graduated cylinder will do, but the burette is better.

3. Fill the (B) burette with the standard KCN solution.

4. Run the 100 c.c. standard copper solution into a beaker and add just enough NH_4OH to produce a deep blue color, no more, say, 5 c.c.

5. Begin titrating by adding about 7 or 8 c.c. of standard KCN at once, then continue by adding only a drop at a time, carefully stirring the copper solution all the time to insure a thorough admixture, until the blue color disappears and a pink color appears. A white background will assist in determining the end reaction. Note the number c.c. KCN used.

6. Try several lots of the copper solution to check results.

7. As we took 100 c.c. of the copper solution, containing one-tenth of a gram of copper, for each titration it should require 10 c.c. standard KCN solution but if your KCN solution is too strong it will take less and if weak it will take more. Whatever it takes, multiply by 10 to find out how many c.c. KCN would react on one gram of copper (= 1000 c.c. of standard copper solution) and mark this number on the KCN bottle for future use.

PREPARING THE ORE SAMPLE.

1. Pulverize a dry sample of copper ore to about 80 (or 100 mesh, if difficult ore to dissolve) and weigh out

exactly one gram, using a good balance—not pulp balances.

2. Place sample in a deep evaporating dish on a sand-bath and add 10 to 15 c.c. strong HCl. Cover with an inverted funnel, the stem of which has been broken off. The funnel must fit *inside* of the evaporating dish. After boiling add from 1 to 10 c.c. HNO_3—the larger amount for ores that decompose with difficulty. Boil to one half or one third the original bulk and add about 10 c.c. strong H_2SO_4.

3. Evaporate till *very copious* white, choking fumes arise—not to complete dryness, or insoluble basic salts will form, in which case more H_2SO_4 must be added.

4. Cool thoroughly.

5. Add 50 or 60 c.c. of water and filter (and wash filter) into a tall beaker and place upon a wire-gauze over a bunsen flame.

6. Add a warped strip of metallic aluminum about 2 by 1 by $\frac{1}{8}$ in. size.

7. Boil (actual ebulition) for five minutes. This will precipitate all the copper. If cadmium be present stop, boiling as soon as the solution clears, for cadmium is not precipitated till after the copper. This is the only metal except gold that will be present to affect results. Ore carrying 62 oz. gold to the ton will consume one cubic centimetre standard KCN solution.

8. Immediately decant through a filter, keeping as much of the precipitated copper in the beaker as possible. Wash the precipitated copper several times with distilled water. Discard filtrate and washings.

9. Place the aluminum strip on the filter paper and dissolve off the adhering copper with strong HNO_3, using as little as possible and having the beaker containing the precipitated copper beneath the funnel. Then add enough HNO_3 to the beaker to complete the solution of the copper and then wash the filter paper till free from $Cu(NO_3)_2$.

10. Dilute the solution by adding 10 c.c. water for each estimated per cent of copper present, judging roughly.

11. Cool to 63° F.

12. Add just enough NH_4OH to produce a deep blue and begin titrating.

If there is a heavy precipitate of aluminum do not filter it out till very near the end reaction—when the blue first begins to fade is a good time.

13. Finish the titration to the same shade of pink obtained in titrating the standard copper solution.

14. The percentage of copper in the sample is formed by a simple proportion. An example will illustrate: Suppose that, by repeated trials on 100 c.c. standard copper solution, we find the average amount of KCN solution required to be 9.4 c.c. (= 94 c.c. on 1000 c. c.) and that a one-gram sample of ore required 31 c.c. standard KCN. Then

$$94 \text{ c.c.} : 100 :: 31 \text{ c.c.} : x.$$

$$x = \frac{100 \times 31}{94} = 32.9\% \text{ copper.}$$

Another example: Suppose 100 c.c. standard copper required 10.2 c.c. standard KCN and that a two-gram sample of ore required 15.2 c.c. KCN. Then

$$102 \text{ c.c.} : 100 :: \frac{15.3}{2} : x$$

$$x = \frac{100 \times 15.3}{102 \times 2} = 7.5\% \text{ copper.}$$

Various ores require different treatment to bring them into solution. Some ores yield to HCl or HNO_3 alone. Never add H_2SO_4 at the same time; the former acids are added as H_2SO_4 decomposes and expels these weaker acids before they have done their work upon the ore.

I will digress to suggest that the practice of using a float in a burette can be greatly improved upon with fairly clear solutions. Use the enameled back burette. If one can not be purchased draw an *india ink* line wide in the centre of a strip of white paper and paste the paper upon the back of a plain burette with shellac and coat with the same to make it waterproof. By reflection, the surface of the standard solution shows a black point indicating the c.c. mark on the burette.

Endeavor to titrate the ore sample under the same conditions as to acid, bulk, temperature, etc., and follow the details given *implicitly* before finding fault with the method. Duplicate samples will agree within less than one tenth of a cubic centimetre. Take one gram sample for ordinary ore, two grams for low-grade ore and half a gram for copper matte.

Minute details have been given to enable the careful assayer, though not a chemist, to do satisfactory work.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Thompson, Mont., marked B. W. J., is Aplite, a fine-grained mixture of quartz and feldspar—a micaless granite.

The mica from Cobalt, Ont., is fairly good in quality, but will, perhaps, improve somewhat with greater depth. Systems of parallel lines are observed crossing each other in this mica, which is to its detriment. These lines are caused by microscopic inclusions of some foreign mineral, probably tourmaline. Usually some parts of the vein contain mica of this kind, while in other portions it will be absent.

The rock from Alleghany, Cal., marked W. S. H., is Quartz with a little talc-schist adhering to one side. The bright metallic mineral is pyrite, and the white scale, that so easily crumbles to powder, is calcium carbonate that has deposited from infiltrating water. A few scales of a white, silvery mineral, are also observed. These are the secondary mica, magarodite, derived from alteration of feldspar of the wall-rock. The rock is probably gold-bearing.

The rock from Eureka, Nevada, marked T. P., is an inferior black marble (calcium-carbonate). It contains disseminated pyrite, and limonite due to alteration of the pyrite. It may be gold-bearing.

SINCE the expiration on November 29, 1905, of the patent rights on the cyanide process held by the Victorian Government, more attention is being paid to the tailing heaps on the goldfields, and small cyanide plants have increased in number. The Government purchased the patents on February 19, 1900, and in order to recoup itself the purchase money, it charged 2½% on the yield of gold. The cyanide process is now free to everybody. The number of plants in the State has increased to about 200, and likewise the number of men employed proportionately.

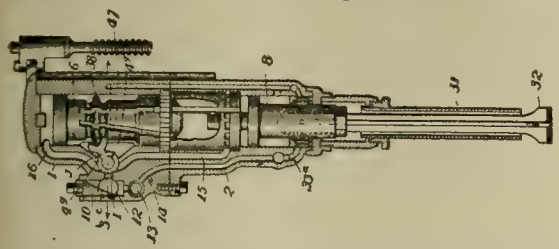
GRAPHITE-BEARING SCHISTS are of widespread occurrence in the Central Alps, but they are rarely rich enough to constitute deposits of economic importance. In these deposits the carbon that has assumed the form of graphite is a primary rock constituent of undoubted organic origin. It is not assumed that the coal was transformed slowly into graphite, but that the process was quickened by the high temperature of the granitic magma.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

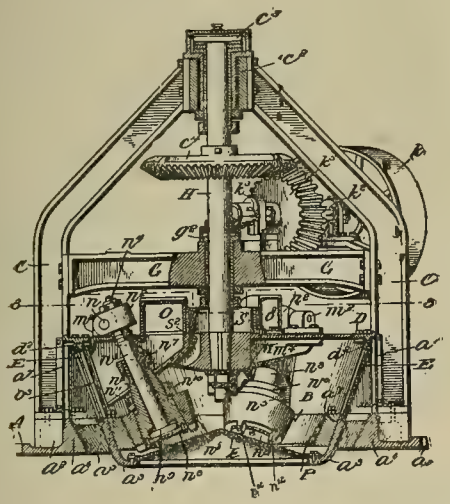
ENGINE FOR ROCK-DRILLING MACHINES.—No. 826,456; Cassius M. Walker, Pueblo, Colorado.

The combination with the cylinder of a rock-drilling machine and with its ports and tapering valve-socket closed at each end, of a tapering valve fitted to said socket, provided with two heads and an intervening web, the ports communicating with the space between the heads, a chamber beyond the larger head of the valve, a port in said head, a socket in the smaller head with separated shoulders below the same, and an arm with a head fitted to said socket and extending between the shoulders to have a limited motion independently of the valve for rocking the latter.



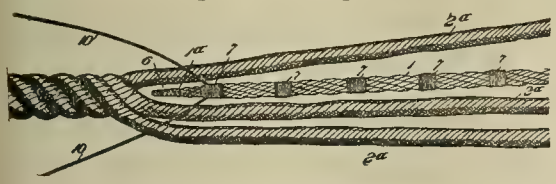
PULVERIZING MACHINE.—No. 826,062; George L. Pratt, Atlanta, Georgia.

In a pulverizing machine, a pan for the material to be pulverized, having its bottom formed as a convex screen, projecting upward into the interior of the pan, and pulverizing members disposed within the pan.



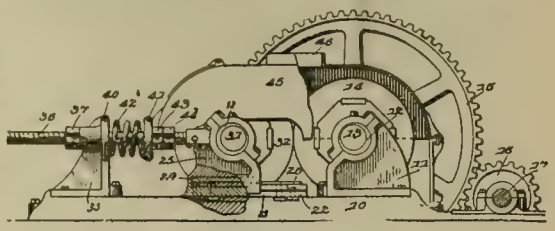
WELL-DRILLING CABLE.—No. 826,063; Joseph Reid, Oil City, Pennsylvania.

A composite rope having the end of its steel rope wound or bound, and the strands of its hemp rope laid about said steel rope by twisting and winding, and secured thereon by a clamping-rivet passing diametrically through both ropes just above the binding on the steel rope.



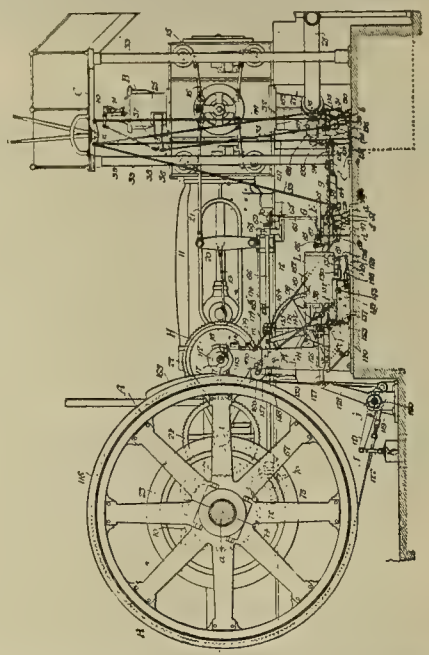
CRUSHING-ROLLS.—No. 826,140; Walter G. Bryant, Carterville, Missouri.

In a crushing-mill, a frame including a pair of longitudinal sills, rigid pillow-box bases carried thereby, a roll journaled in said pillow-box bases, a flanged guide-bar carried by each sill and having a recessed upper face, wear-strips seated in the recesses, slidable pillow-box bases mounted on said guide-bars and having inturned flanged portions embracing the same, said slidable pillow-box bases being also recessed, wear-strips arranged in the recesses of the slidable pillow-box bases and bearing against the corresponding strips of the guide-bars, a roller journaled in the slidable pillow-box bases, and springs engaging said slidable pillow-box bases and tending to force the rolls into engagement.



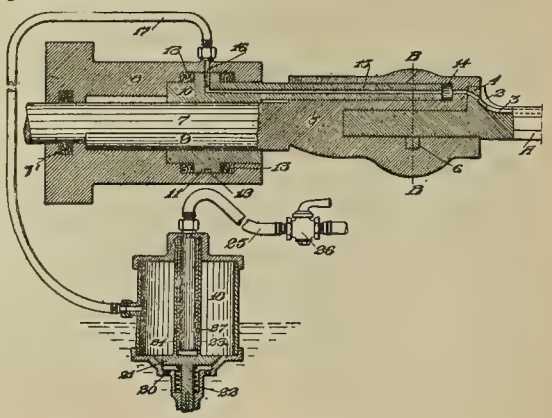
HOISTING-ENGINE.—No. 826,956; Sven T. Nelson, Chicago, Illinois.

In hoisting-engines, the combination of engine-controlling mechanism; a brake and means driven by the engine for automatically and successively operating said controlling mechanism and said brake.



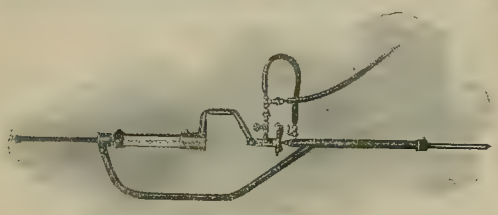
ROCK-DRILL.—No. 826,108; James Mathers, San Francisco, California.

In a rock-drill, means for supplying water to the drill-hole, said means consisting of a pipe, a drill-shank having a channel within which the pipe is fitted, a socket member at the head of the shank, a chuck into which the drill-shank and socket member are inserted, a pipe upon which the chuck is slidable, said pipe being in open communication with the socket-member and the pipe which is fitted to the drill-shank, and means for supplying water to the pipe upon which the chuck is slidable.



The Iler Hammer-Drill.

We herewith illustrate the Iler Hammer Rock-Drill, which is somewhat different from other hammer-drills. The weight of the drill itself is from 15 to 30 lb., and is easily handled, and can be pointed and operated readily for side, down or upper holes without the use of column. As a convenience and advantage, however, a stoping bar, weighing but 11 lb., made of bicycle tubing lined with brass, is furnished; this enables the workman to keep the machine in constant operation and do more work proportionately. A peculiar and meritorious feature of this drill is in the complete rotary movement or revolution of the bit. The bits are of four-point pattern, and even if one or more points



break in operation, the operator is enabled to continue driving a round and straight hole, because of the complete and continuous rotation of even the broken points. Besides the rotary merit it is well to remark that the drill, being mounted on a brace or crank, for the means of rotation, the operator is given the advantage of the leverage from the crank, while the butt serves as a throttle, swivel, and cushion. In the operation of a 15-lb machine of 2½-in. stroke, 12½ cu. ft. of air under a pressure of from 70 to 110 lb. is required, and for one of 30 lb., with 6-in. stroke, 30 cu. ft. of air. Delivery of air to the drill is made through a tube to the interior of the barrel, as in the case with other air-hammer drills. Already over 200 of these machines are in use at Cripple Creek and in other mining districts in the United States. The machines are being manufactured by the Iler Rock Drill Mfg. Co. at Denver. This company is also manufacturing a valveless type of drill, which is meeting the demands of the trade for a less expensive machine.

Commercial Paragraphs.

ALLIS-CHALMERS Co. announce that its Denver office has been removed to the McPhee Bdg., 17th and Glenarm St., and the El Paso office to the Guarantee Trust Bdg., rooms 301–306. The Boston office is at 50 Congress Street.

SHIRLEY & GRANT, of Reno, Nev., have entered into a contract with the Traylor Engineering Co., of New York, whereby they have become the sole representatives of that thriving New York concern for the entire State of Nevada.

THE BUFFALO STEAM PUMP CO., of Buffalo, N. Y., recently installed a large pumping plant for the McBryde Co. of the Hawaiian Islands. The pumps are electrically operated and were required to prove a very high efficiency by actual test.

THE ELSPASS ENGINEERING & MINING MACHINERY Co., J. H. Elspass, manager, has opened offices at 1650 Champa St., on the ground floor of the Boston Bdg., Denver, Colo. L. S. Pierce, manufacturer of the Pierce Amalgamator, will also have his office at this address, removing from 1653 Welton street.

THE C. H. SHAW PNEUMATIC TOOL CO. recently received a telegraphic order from Walter Douglas, general manager of the Copper Queen Con. Mining Co. at Bisbee, Arizona, for fifty Shaw's Eclipse Air-Hammer Rock Drills. This is claimed to be the largest single drill order ever placed by one man in the United States.

THE DOUGLAS COPPER CO. has just placed with the INGERSOLL-RAND Co. an order for a cross-compound, high-speed, two-stage air-compressor, having a capacity of 3,700 cu. ft. of free air per minute. This is one of the largest compressors on the west coast of Mexico, and is to be erected at the No. 1 shaft of their El Cobre property in Sonora, Mexico. There is also to be installed a second battery of boilers and condensing machinery. This, together with the 250-h.p. hoist built for them by the RISDON IRON WORKS of San Francisco, and which went into commission in June, makes the surface equipment at this shaft ample and up-to-date in every respect. Theodore Douglas is now on his way West to close a contract on the Pacific coast for the building of five 110 h.p. traction engines and twenty-five 20-ton ore-trucks to operate between El Cobre and the smelter.

THE ALLIS-CHALMERS CO.—A mammoth gold dredge for service on the Forty Mile district of the Yukon Territory was built this summer at White Horse and floated down the river to its destination. The timbers and machinery for this dredge were dispatched north from Vancouver, and the work of assembling it at White Horse commenced early in the season, so that the completed dredge was started down the river as soon as possible after the ice went out. The mechanical equipment was ordered by the Forty Mile Gold Dredging Co., of Toronto, Canada, through the Canadian representatives of the Allis-Chalmers Co., of Milwaukee. The dredge equipment, which was furnished complete by Allis-Chalmers Co., is special in nature and adapted to the particularly heavy service of the Forty Mile. The dredge proper will be equipped with 5⅛ cu. ft. buckets. The accessory machinery, ready for operation, was shipped from the various works of the Allis-Chalmers Co. It consists of engines, pumps, boilers, concentrating machinery and a small electric-light plant.

THE LINK-BELT CO. succeeds the Link-Belt Machinery Co., of Chicago, which was organized in 1880 for the purpose of manufacturing labor-saving appliances, employing the product of the Ewart Mfg. Co., of Indianapolis. In 1882 a branch office was established in New York. In 1888 this department had grown to such an extent that it became necessary to have a manufacturing plant located in the East, and in that year the Link-Belt Engineering Co., of Philadelphia, was organized. At no time have the three companies been competitors; the Ewart Mfg. Co. continuing as manufacturers of chain, while the two Link-Belt Companies have operated along exactly similar lines, each in its own territory. The present consolidation was effected by the Link-Belt Machinery Co., of Chicago, purchasing the plants and assets of the Ewart Mfg. Co., of Indianapolis, and the Link-Belt Engineering Co., of Philadelphia. The new company controls three splendidly equipped plants located at Chicago, Indianapolis, and Philadelphia, and the line of manufacture covers the entire line of conveying, elevating, and transmission machinery, malleable and machine-made driving chains.

Publications Received.

THE PRODUCTION OF QUICKSILVER, of Gypsum and Gypsum products; and of Mineral Waters in the United States in 1905, being advance sheets of the mineral resources of the United States for 1905.

THE preparation of ores for dressing by hydraulic classification seems to be the stumbling block of many millmen. Its principle is acknowledged as being the most economical, but the operation and results are far from satisfactory. If we feed crushed ore into a column through which is passing a well-regulated upward current, such particles as are of sufficient weight will fall through the current, while those too light will be held at the top of the column; but if the fine in suspension is not removed from position directly over the column, it will remain there only until a sufficient quantity or weight is accumulated and then drop in a body through the current which rejected the particles individually but which lost its power through their accumulation. Thus it will be seen that a most perfectly designed sorting column would not perform the work expected of it unless combined with a method of carrying away such fine as it would reject. The settling arrangement can be of different forms, but it must bring all ore particles in contact with the hydraulic current, and simplicity of design, with positive operation, is the principal necessity.

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Editorial.

THE MACHINERY FIRMS of San Francisco have shown remarkable recuperative power, overcoming the effects of the disaster of April 18 with an indomitable spirit. Among them we venture to mention the Fulton Iron Works, which was reported in the daily press as having been destroyed by fire a second time a week ago. We are informed—and it gives us pleasure to state—that the fire reached only a portion of the foundry and will cause not more than a delay of a week in making castings. We congratulate our friends.

THE QUESTION, 'Who is a Mining Engineer?' is answered by a veteran whose name we are asked not to divulge. We have received several other letters on the same subject, and it is evident that the engineer who hid his fame under the *nom de guerre* of 'Viator' has started a buzzing which may or may not indicate a hornet's nest. The subject is one on which each of us could say something and we anticipate a lively, and possibly useful, discussion. Let it be polite, though penetrating.

THE LAGRANGE MINE in Siskiyou county is, we believe, the largest hydraulic mine in operation in California, for it delivers its tailing into a river system free from the legal restrictions that almost killed hydraulic mining in this State. Another large mine of the same class is that at Cherokee, which is described in detail by Mr. D'Arcy Weatherbe. It affords a good example of this kind of mining and the writer has treated his subject in a manner likely to prove instructive, as well as interestiug.

THE GERMAN EMPEROR has given his personal approval to the art of 'dowsing'—that is, the use of the divining rod or forked stick for finding hidden springs, veins of ore, and buried treasure. President Roosevelt has come out as an official and officious advocate of spelling reform. If one of the great irrepressibles passes upon the use of the hazel twig and the other on spelling, why should not one or the other of them pose as an authority on ladies' hats and babies' food? Let the shoemaker stick to his last, and other people to their proper business.

A LESSON may be conveyed in a parable and a moral by a story. Mr. Theodore F. Van Wagenen's recital of the experience of an Australian miner in Rhodesia is excellent, even without its deeper purpose. When an American engineer can write sympathetically in behalf of an Australian miner in Africa, we have a conjunction of interest that is eloquent of the cosmopolitan character of the industry involved. Mining laws are open to destructive criticism and most of us would like to have the laws we have not got; many Americans prefer the simple Australian regulations to their own apex law with its

interminable litigation; others may like the directness of the Mexican 'denouncement' and concession; Australians complain of the lack of protection on the dip when a vein cannot be followed beyond vertical side-lines, and there must be some Mexicans who would like to have a little litigation with their neighbors. All the regulations and laws are misfits at some time or place, because Nature has an endless versatility, making no two lodes exactly alike.

The Power of Public Opinion.

The strike on the street railroads of San Francisco ends as we go to press. It lasted eleven days, just long enough to emphasize the fact that public opinion, if crystallized into expression, is the most effective weapon for stopping unreasonable conflicts between the employer and the employed. San Francisco had bowed her head to those mysterious forces which are legally known as acts of God, but she was in no mood to suffer the folly of those who lightly interfered with the work of re-building and restoration. The average citizen, like Mercutio, exclaimed: "A plague on both your houses, Union and Corporation." And they gave heed; for a strike or a lock-out without public sympathy is bad business. It is not often that the public expresses itself so quickly or so clearly. On this occasion there were two factors which stood out from the confusion of conflicting statements; one was discreditable to the combination of many men represented by the Labor Union and the other was equally to the discredit of the combination of the few, the Corporation. After the last strike, the men of the Union, by their duly chosen representatives, signed an agreement accepting a certain rate of wages and hours of work, and binding themselves not to strike during the term of the agreement, which expires next year. This contract they broke. We know, of course, that since the earthquake-fire, they have had to work under difficulties and in the face of steadily rising prices; nevertheless, a contract is a contract and among people with any sense of honor, the breaking of it is the mark of a bad citizen. It may be that the Corporation would have shown as much sense as generosity, if it had volunteered to abrogate the contract, having regard to changed conditions, but as it did not pursue such an obvious policy, it remained for the car-men to live up to their agreement like good Americans. No man is a good American who goes back on his word. A true man has the spirit of a sportsman, in the higher sense, he 'plays ball' no matter how badly things are going against him. By their precipitate action, the men of the Union forfeited the sympathy of the community.

On the other side, it was apparent that the United Railroads Company was forced into an exacting attitude because, being a much over-capitalized concern, its officers could not make such concessions as would entail a diminution of profits. The greed of a corporation is often the logical result of heavily watered stock. By that kind of financial manipulation the dishonesty of which is held by the unthinking to be condoned by its cleverness, the promoters of public utilities are enabled to make fortunes over night, passing a heavily burdened business to men who then can only make it pay by becoming deaf to the dictates of humanity. On the present occasion the community recognized that the United Railroads had disregarded the well-being of the city, and though it approved the demand for a fulfillment of the contract made by the Union, there was a distinct feeling that the Corporation had been overbearing, at a time when a little tact and consideration would have obviated any rupture.

The strike will have proved a blessing if it has impressed the representatives of both capital and labor that there is a third party to be reckoned with, and that either will forfeit the support of public opinion if it disregards the sanctity of a contract or the well-being of the community.

ALL ALONG the Mother Lode in California, and chiefly in the counties of Amador, Calaveras, and Tuolumne, there is a shortage of machine-miners, and even mine-laborers. In the region mentioned many of the miners have lived in the same locality since childhood and have had steady employment. Now, however, the unusual conditions at San Francisco and in Nevada threaten almost to depopulate these old mining centres. High wages have attracted many to Nevada who make no distinction between the comforts of home life in the foothills of California and a rough time in desert camps. They want the higher wages even though it may not increase their bank account a single dollar or add one comfort to their existence. The re-building of San Francisco, San Jose, and Santa Rosa is giving employment to thousands, so that artisans are in demand at high wages. Of the laborers, the railroads are employing an unusual proportion, and many have left the mines for this kind of open-air employment. The orchards and fields also need the usual percentage of wandering population.

IN THIS ISSUE appears the second portion of Mr. R. Gilman Brown's article on 'Cyanide Practice With the Moore Filter.' To those millmen who employ cyanide this description of the practice at the Standard mine will prove interesting and useful. The Standard at Bodie has been one of those mines that continued profitable long enough, and presented problems sufficiently difficult, to afford good training to several successful professional men. Thomas H. Leggett, R. G. Brown, F. L. Bosqui, Theodore J. Hoover and R. C. Turner may be mentioned among those who gave knowledge to, and took experience from, the old mine—that is, old to us in the West. In this last development of metallurgical practice we have the application of a method of filtering, the details of which are likely to be modified by each manipulator. It is the invention of Mr. George Moore and some of its mechanical features have been since improved by Mr. Charles Butters, with further modification by Mr. H. R. Cassel. Now that millmen have broken away from the filter-press, there is likely to be plenty of ingenuity displayed in the devising of filtering machines that can strain slime on a large scale and cheaply. In this direction lies the hope of a decisive reduction in the cost of cyanidation.

By the Way.

THE GOVERNMENT MINING ENGINEER in the Transvaal has published his report for the last half of 1905 and gives some interesting data.

The average number of stamps running during the half year was 6,567, as against 6,162 for the previous half year. The duty per stamp per 24 hours averaged 5.032 tons, as against 4.965 tons for the preceding six months. In December, 1905, the producing mines of the Witwatersrand were giving employment to 18.797 persons per stamp, as compared with 20.003 persons per stamp during June of the same year.

The following figures show the work done by the gold mines of the Transvaal during December, 1905, as compared with August, 1899, before the war:

	August, 1899.	December, 1905.
Number of stamps at work	6,070	7,294
Tons ore crushed	856,233	1,041,092
Duty per stamp per diem, tons	4.86	5 108
Total yield, ounces	410,965.05	430,985.804
Fine gold per ton crushed, dwt.	9.599	8.279
Yield from mills only, ounces	265,584.10	270,327.563
Percentage of yield from mills	64.624	62.723

During the half year the yield per ton crushed by gold mines, based on the officially declared output, which does not include gold contained in by-products not treated at the mines, was 8.220 dwt. per ton. Including the gold estimated to be contained in the products sold, the total yield per ton crushed is found to be 8.285 dwt. per ton.

The following statement shows the number of mines using machine-drills, and the average number of drills in use since June, 1902:

WITWATERSRAND AREA ONLY.

	Number of mines using machine-drills.	Average number of machine-drills in use.
1902, June	50	671.0
" December	60	994.0
1903, June	68	1,313.7
" December	72	1,561.2
1904, June	70	1,631.0
" December	76	1,746.1
1905, June	78	1,647.4
" December	79	1,898.1

The average percentage of waste sorted from rock hoisted during the half years was 16.6, as against 17.62% for the preceding half year.

MINING IN JAPAN.—On his return from a professional journey to Japan, Mr. R. J. Frecheville was interviewed while passing through San Francisco, and he delivered decided opinions in regard to the lack of a good opening for the profitable investment of the British capital he represents. Anglo-American companies would bankrupt themselves, he considered, in trying to pay expenses in mines that are yielding rich returns to the Japanese. He found much to surprise and interest him in the Japanese mining districts.

"I found at Kosaka," he said, "mining on a scale that astounded me. The ore there runs about two per cent copper and carries a little gold and silver. It is easy of access and they have a well-equipped smelter, which handles about 1,000 tons of ore per day, and they are clearing about $250,000 every month. Before they built their plant they sent their own engineers all over the world, helped themselves to the best ideas they encountered, and have embodied the knowledge thus acquired into what is probably the most perfect mining and smelting plant in the world. They have electric haulage, aerial tramways, and a fine water-jacket plant. They employ about 3,000 men and their payroll amounts to next to nothing. If a foreign concern tried to operate there and pay the same wages it would be accused of oppressing the people and, anyway, no foreigner could get anything like the same amount of work out of these Japanese laborers. All over Japan I found conditions the same. The Japanese loves his native village, and will work for a pittance without complaint if he can get that work without leaving home. During the harvest season all hands quit the mines and gather the crops. Not only do the men work, but they take their wives and children into the mines, and these auxiliary forces render invaluable service as ore-carriers. In large mines and small I found the same conditions. Low-grade ore everywhere, but cheap labor and plenty of it. The country is hilly and the mines are worked by running drifts into the hillsides. This saves the expense of pumping, which is quite an item under our methods. Japan's mines are of great value to Japan, but no good to anyone else."

AUSTRALASIAN GOLD YIELD.—The production of gold in the States of Australia and in New Zealand shows a slight decrease for the last six months, ending June 30.

	First Half-Year 1905 Fine Oz.	First Half-Year 1906 Fine Oz.
Western Australia	965,372	904,861
Victoria	338,747	381,681
New South Wales	111,869	133,150
Queensland	290,478	251,986
New Zealand	238,085	252,001
Total	1,944,541	1,923,679

To which mus be added the output of Tasmania, about 35,000 ounces.

The most noteworthy feature is the continued decline in the yield from Western Australia, where the gradual exhaustion of the big, rich mines is not being balanced by the development of new prospects. During the past three months the most encouraging feature has been the finding of good ore in the bottom workings of such famous producers as the Great Boulder Proprietary, Golden Horseshoe, Ivanhoe, and Kalgurli, all at Kalgoorlie. However, despite the falling off, Western Australia still produces about one-half the gold that comes out of Australasia. For the last half-year her share was 47 per cent.

In Victoria there is healthy advancement, the increase for the first quarter having been 16,437 oz. and for the first half-year 42,934 oz. The total for the six months is the best in 30 years. The Bendigo, Walhalla, and Warrandite districts show the greatest gains. Dredging is also credited as a factor in the increase. If the 'deep lead' companies, which look promising, should overcome the water in the old alluvial channels, there will be a marked increase in Victoria's gold production.

In Queensland recently there has been an accelerating rate of decrease, but it is pleasant to note that other branches of her mineral industry—such as copper and tin—exhibit prosperity. In New South Wales, the increase was mainly in May and June, the production being curiously variable from month to month. In Tasmania, the output is 35,000 oz. for the half-year, the Tasmania mine at Beaconsfield and the New Golden Gate at Mathinna being the chief producers. In New Zealand there is a steady gain; the Ohinemuri and Thames districts are prosperous and the great Waihi mine continues to hold its own. In Otago the dredges are doing fairly well. On the whole, therefore, the gold mining industry of Australasia is thriving; it is a continent large proportions of which are comparatively unprospected, and this fact must be taken into account when estimating the future production. At the present rate the production for 1906 (including Tasmania) will be worth $80,000,000.

Special Correspondence.

London, England.

Market Fluctuations. The Camp Bird Annual Report. Esperanza and El Oro Production. Rich Ore Reported in the Bottom of El Oro. Some Cornish Returns.

The improvement in the Kaffir market affords an opportunity to the inevitable share-pusher to invite the public to "come in" and buy shares with a certain prospect of dividends of from 5 to 7% and a good probability of a market rise. It is to be hoped that speculators will not be so foolish as to follow this advice; stock in a mine however well established and wherever situated is not worth buying at par if it does not yield or show the probability of yielding in the near future well over 5%. A notable case of unexpected fluctuation in a first-class mining stock during the last few days is the Mysore, the drop being caused, it is thought, by the fear that owing to the death of Sir Charles Tennant, his big holding is in course of liquidation, combined with the recent history of Champion Reef, although it is stated on the highest authority that so far as the Mysore mine itself is concerned there is nothing to warrant any uneasiness as to the stock. Special attention is being drawn to Tanganyikas on the rumor that the Lobito railway scheme is being backed by prominent American capitalists who are eager to share in the "vast copper wealth shortly to be brought into commerce" in that part of Africa. Mr. James Liddle (consulting engineer for the De Beers) is cited as an exponent of the good things awaiting the employment of capital in Africa. This gentleman is reported as having been on a tour of the entire United States for the purpose of studying mining and milling conditions and to investigate the practical application of recently invented machinery to every-day use. While stating that the development of the mining industry in the United States is wonderful, and that the industry will be enormously greater a few years hence, Mr. Liddle is reported to hold the opinion that the mining industry in Africa is still in its infancy. There are enormous areas to be explored, and it seems certain that these great areas, when they have been explored, will show even greater wealth than those that have been opened.

The report just issued by the directors of Camp Bird, Limited, for the year ended April 30, states that, after providing for every description of expenditure, the accounts show a profit for the period of £175,064. Deducting £35,370 for estimated losses due to snowslide and fire in March, 1906, namely, stores, £5,370, and stamp-mill, £30,000, and adding £111,940, brought forward, there is a total of £251,634. The three dividends of one shilling each paid during the year absorbed £123,000, directors' remuneration of 1% £1,396, and income tax to date £11,617, leaving £115,620, which it is proposed to carry forward. For depreciation of plant, £10,024 has been written off, this amount being 10% of the estimated value of the equipment as at April 30, 1905. Development has proceeded satisfactorily, a total of 7,371 ft. having been driven, raised or sunk. After treating 66,223 tons of dry ore, the reserves were 120,477 tons broken in the stopes and 90,443 tons blocked out, making a total of 210,920 tons of dry ore in reserve, which Mr. A. C. Beatty estimates will yield a profit of approximately $4,300,000, after realizing a net profit during the year of £175,065 and paying Mr. Thomas F. Walsh £59,066. From the ore treated during the year an extraction of 95.53% of the gold values has been obtained, making $28.57 per ton. Exclusive of depreciation of plant and cost of reconstruction, the total cost at the mine was $9.90 per ton. All machinery had worked satisfactorily up to the time of the disaster. The work of reconstruction is progressing favorably, and it is hoped to have the new stamp-mill erected and in working order during December next. In regard to Imogen Basin Gold Mines it is stated that up to April 30 £27,663 was expended, Camp Bird receiving 540,000 shares of £1 each in the Imogen Basin Company.

Mexican mining returns for July are beginning to come forward. The cabled report of Esperanza for the month is as follows: The mill ran 29 days and crushed 13,890 tons of dry ore; shipped to smelter 6,784 tons of dry ore; estimated realizable value of bullion produced, $147,225; estimated realizable value of concentrate, $81,563; estimated realizable value of ore shipped to smelter, $481,131; receipts from rents and other sources, $1,486, making a total of $711,405; less working expenses, including development, marketing of bullion, freight and treatment charges on ore shipped to smelter, $292,998; allowance for depreciation of plant, $2,500; consulting engineers' fees and New York office expenses, $2,546, aggregating $298,044; estimated profit, $413,361, less London expenses of about £250. Of this there has been expended on construction account $4,744 and prospecting on Suceso property $3,215.

El Oro reports that in July the No. 1 100-stamp mill ran 29 days, and together crushed 22,378 tons of ore; total estimated realizable value of the product, $180,490; less working expenses, $92,843; less development expenses, $10,238; profit, $77,409; profit from the railway, $9,388; total, $86,797, less London expenses and general manager's salary, £700. The sum of $3,095 was expended during the month in permanent improvements. (The amounts in each case are in U. S. currency.) Under the heading of 'Good News for El Oro,' the enterprising financial editor of a London daily paper states: "We have received a cabled communication from our correspondent in Mexico of an important nature, not only to shareholders in El Oro Company, but also to those in the Esperanza Company, and to everyone interested in the field. It is to the effect that the news of the rich strike made on the San Rafael vein in El Oro mine is fully confirmed, rendering the value of the entire district considerably greater even than it was supposed to be. It appears that it is after several years of diligent search that El Oro has struck the exceedingly rich sulphides corresponding to those in the Esperanza, and that this substantiates the value of the deep levels of both companies. The cablegram adds that the Esperanza output this month will be the largest it has ever made, and that the whole district is very jubilant."

Following the example of its neighbor, Dolcoath, the accounts of the Carn Brea & Tincroft Mines, Ltd., show a striking advance on previous records of late years. The profit on the six months amounts to £10,162, due to a certain extent to the higher average prices of ore sold.

SUMMARY OF THE ACCOUNTS.

Tin stuff crushed		30,055 tons
Black tin sold		402 "
Produce per ton of stuff		30 lb.
Average value per ton of stuff		£1 5s. 4d.
Average price per ton of tin, including slime tin		£94 18s. 4d.
Amount realized	£38,186	0s. 0d.
Total receipts	£44,442	0s. 0d.
Per ton of stuff		£1 9s. 6d.
Working costs	£34,280	0s. 0d.
Per ton of stuff		£1 2s. 9d.
Profit	£10,162	0s. 0d.
Per ton of stuff		6s. 9d.

The manager (Captain John Penhall) states that the high prices of all the minerals sold have told greatly in favor of the mine. The new concentrating plant and machinery recently completed at the dressing floors are working satisfactorily, and tailing is now being treated which formerly could not be touched.

Butte, Montana.

Trespassing on Railroad Property. Improvements at the West Colusa, High Ore and Corra Mines. New Veins Cut in the Butte-Argenta and the Eagle. Good Developments in the Rarus and Alliance.

With the proof of the value in quartz veins south of the Butte hill, where the land is covered with wash to some depth, and was originally taken for placer mining, there has been a scramble on the part of speculators to make locations on territory which is for the most part patented placer ground. Against the owners of several of these claims the South Butte Co., which appears to be the holding company for the mineral rights of the Montana Central, has brought suit. H. V. Winchell, formerly head of the Amalgamated geological department here, but now chief geologist for the Hill interests, is named as one of the plaintiffs. It would seem that the Hill interests are getting in shape to work their mineral holdings in this section in the near future, and the fourteen suits instituted are evidently to quiet title. Among the claims located, in whole or in part, on this railroad territory are some belonging to the Alliance, Green Copper, and Butte Central companies. The only company which was actually working the ground was the last mentioned, and it has been enjoined from continuing operations. Mr. Winchell says that the mineral lands belonging to the Hill system are being placed in the hands of holding corporations separate from the railroad company, so that they can be more conveniently handled.

The Boston & Montana Co. has closed down the West Colusa shaft for repairs. In the meantime the Leonard, which is connected on several levels with the West Colusa, has increased its payroll considerably, having over 900 men on the roll at present. The West Colusa shaft is the only one in camp with cages large enough to take mules and horses down without binding them and putting them in a sitting posture. The animals for the Leonard are taken down this shaft. The connections of the mines are however not such that much work can be done in the West Colusa during the shut-down, and probably little ore will be mined in the workings of this mine for the next month or six weeks. The Mountain View mine, which opened up last week, will keep the company's output at about the usual mark, and some West Colusa ore will be hoisted by the St. Lawrence.

The High Ore mine has nearly finished cutting the station on the 2,400-ft. level, and sinking will be begun in the pump-shaft soon. The High Ore mine, which is situated on the Belk claim, was sunk originally by Marcus Daly mainly as an air and pump-shaft, to take care of the water from the hill mines; but, owing to the fact that the shaft is in some of the best ground on the hill, the mine has been developed with good results. The ore has been found rather more in pockets than in the other large mines in the vicinity, however, and at present only about 700 tons per day are being hoisted, although the mine is one of the biggest in Butte. On several levels there has been a large amount of cross-cutting to the north of late, and it is thought that some of the veins that enter the North Butte property farther to the east will be worked from this shaft.——The old Berkeley shaft, which has recently been put in commission by the Butte & Boston Co. after several years of idleness, is now yielding 400 tons of copper ore per day. The same company may soon open up the old Silver Bow shaft No. 3, which has also lain idle for a long time. This shaft will be used to facilitate the workings of the Silver Bow mine, which is now being worked through only one shaft, but which contains some good veins, and is expected to make a big ore producer.

The Minnie Healey has been closed down for repairs to the shaft. The shaft of this mine has been cut down by the Rarus fault, and has always been in rather poor condition, the ground being soft for a long distance. It is not known how soon work can be resumed, as the condition of the shaft has been very bad for several years, and has lately become so that the cages could not be run through it. The water from the mine will be run through the Leonard and pumped out of that shaft. The Minnie Healey has been yielding 350 tons of ore per day to the Red Metal Co. for some time past.——The Corra shaft, which has been in the process of sinking, is now within 150 ft. of the 2,400-ft. level. A station is being cut at the 2,200-ft. level. The Corra is one of the oldest copper mines in the district and was a good producer while in the hands of Heinze. The Red Metal Co. intends to open it up in good shape.

The Butte & Furnace Creek Copper Co., which was organized here some weeks ago, with John McGinniss, the mayor of this city, as one of the chief promoters, has changed its name to the Furnace Creek Extension Copper Co. George W. Irvin, postmaster at Butte, is president of the corporation. Their claims are in the Funeral range, Inyo county, Cal.——The Pittsburg & Montana Co. has leased its mines near Helena to some parties from that city. The mines were chiefly valuable for the silica in the ore, which made a flux for the Pittsmont ore while the company were running their own smelter here. The copper ore is now being shipped to the Washoe smelter. ——The Butte Argenta Co. has cut a vein of copper ore in their claims at Argenta. The vein is 30 ft. wide, but the ore is low-grade, running less than 4% copper, with a little silver and gold. The company hopes to get a spur from the railroad and then will be able to ship the ore and get a return which will yield a profit.

The Eagle Mining Co., working the Eagle claim, has struck some stringers of peacock copper ore on the 200-ft. level. The mine yielded good silver ore years ago, and has been producing again this summer in the hands of the new company. There is not much of the copper ore, but it is remarkable as being found in a region where copper has not yet been found in rich deposits, the mine being north of the old silver mines of La France and the Walker brothers.——In the Rarus mine of the Red Metal Co. the vein known as No. 16 has been cut on the 1,600-ft. level. This opens up a large reserve of ore for the company, and will probably enable the Rarus to make an output compensating for the closing down of the Minnie Healey shaft.——The National Mining & Smelting Co., of Saltese, have filed notice of a change of name of the company to the New York and Saltese Copper Mining Co., and the capital stock has been increased to $5,000,000, in $10 shares.

The Montana Zinc Co., which operated the old Alice mill that recently burned down, has not yet received the insurance, and so is not in a position to make final plans for the future.——The North Butte Co. is taking out about 1,100 tons per day from the Speculator shaft, an increase of 200 tons as compared to a week ago. This is due largely to the increased facilities made by the installation of the skip-chutes and ore-pockets, which have been completed on the 1,200-ft. level. There will be a further increase of output shortly when the chutes and pockets on the other two levels are completed.

The Alliance Copper Co., which owns a large piece of placer ground near the Montana Central yards in the south part of the city, has struck a vein of copper sulphide in their Alliance shaft. The vein has already produced shipping ore farther to the west, and some of the claims on the same vein are the objects of the suit and injunction by the South Butte Co. above mentioned. The Alliance

company is associated with the Farrel Copper Co. which owns a large tract of placer ground just south of their land. With the present dip of the vein it will stay in the ground of the two companies for several thousand feet in depth. The Alliance shaft struck the vein not far from the surface, but did not encounter the orebody until near the foot-wall. They are now raising to explore the extent of the ore, which runs 16% copper in grab samples. The ground lies to the southwest of the East Butte Co.'s holdings, and is about the southern limit of the copper-producing country hereabouts. The shaft of the Moonlight mine of the Washoe company has received a 200-ft. extension through the raise from the 1,500-ft. level of the Never Sweat. The new part of the shaft will not be used immediately for mining purposes, being raised primarily to supply air in the Never Sweat. The raise was made on stope-sets instead of shaft-timbers, but when the Moonlight is ready to use it, these will be replaced by regular shaft-sets.

Bisbee, Arizona.

Increased Output of Copper. The Orebodies in the Shattuck-Arizona Mine. New Equipment. Diamond-Drilling in the Denn-Arizona. Good Prospects in the Cochise.

The month of August showed an increase in the output of copper from the Warren district. At the Copper Queen smelter, at Douglas, the output exceeded that of any other month, excepting March, when the gross output was 8,750,000 lb. of copper. Production at the Calumet & Arizona was normal. The output at the Copper Queen was 8,500,000 lb., and at the Calumet & Arizona, 3,950,000 lb. There is no material change in the equipment of any of the smelters.

The hoist at the Cuprite shaft on the Copper Queen property broke down on Friday evening. It was necessary to close down for repairs, but work was started again on Saturday. This was the only incident this week on the Copper Queen holdings. Everything is about the same as usual at the Calumet & Arizona, and Superior & Pittsburg properties. The tramway on the Shattuck-Arizona property has been working for the past week in a satisfactory manner; 200 tons of ore are being hauled over the tramway every day, and loaded at the railroad spur. The average will be increased after a month or six weeks to 300 tons. Shipments are being made to the Copper Queen smelter at Douglas. On the 800-ft. level there is a new sulphide orebody, which is one of the richest yet encountered in the mine. The ore averages about 25% copper. The two raises from the 800 to the 700-ft. level are both in oxidized ore, and stopes will be started this week. On the 700 five orebodies are being opened up. There are four stopes on the 800 at the present time, and eight on the 700. The drift on the 600 is in lode-matter and iron ore. The material for the new office building is now on the ground, and the work of erecting the structure will be commenced this week. A clearing has been made for the new building back of the tramway terminal. The hoist borrowed from the Junction people has been put into commission and all of the hoisting at the present time is being done with this engine. It was erected on the opposite side of the shaft from the old engine-house. The old hoist is being used at the present time on the single-deck cage. A new building is to be erected on the site of the old engine-house and the new Sullivan air-compressor will be placed there as soon as it arrives. The Junction hoist will be used until the new Allis-Chalmers hoist, which was ordered some time ago, arrives. At that time a new engine-house will be erected, and the equipment on this property will then be complete.

At the Denn-Arizona, sinking of the shaft was resumed today. It was necessary to discontinue work in the shaft a couple of weeks ago on account of the breaking down of one of the pumps. The pump was repaired, and is working satisfactorily. The stations for the Prescott pumps have been completed, and the work of laying the foundations for these big pumps is now under way. The east drift, on the 1,000-ft. level, has been driven about 600 ft., and is now in a limestone and iron formation. The cross-cut, which will be run to the diamond-drill bore, will be run in accordance with the surface position of the bore. It is expected that the hole slants with depth, but this will not be taken into consideration until the cross-cut approaches the vicinity.——At the Cochise property a material change was noticed in the shaft this week, when the 700-ft. mark was reached. Red iron oxide was encountered, and since that time talcose matter carrying a low percentage of copper has been exposed. It is a brecciated formation, and the outlook is favorable. The drift on the 300-ft. level is still in limestone. It is understood that a drift will be driven southwest on the 700-ft. level, but this matter has not been definitely settled. The finding of iron in the shaft has been looked upon very favorably, as it has almost invariably been a forerunner of copper ore in this district.

Melbourne, Australia.

The Mine Fires at Broken Hill. The Proprietary's First Spelter Plant. Discovery of Carnotite at Olary. The Deep Leads in Victoria. The Great Cobar Flotation. Luck of the Lessees and the Story of Gold Found in the Copper Ore.

In my last letter dated April 12 and written before the news of the earthquake at San Francisco had shocked Australia, I dwelt on the injury done to investment in Broken Hill through the fires at the Proprietary and the Junction mines. Since then the fire has been completely subdued in the Junction, but not without the adoption of heroic measures. As no progress was being made in combatting the outbreak, as there were signs of a serious collapse of the Junction North shaft adjoining, and as the men in the North and British mines were unable to work except at great risk from the pyroligneous fumes from the burning Oregon pine, it was decided to flood the Junction mine. This meant also flooding the Junction North and the North Broken Hill mines practically to the 400-ft. level. Broken Hill is an arid region with a poor water-supply, but the elements were kindly and the three companies were furnished with water at 2s. 6d. per 1,000 gal. by the local water-supply company as against 5s., the usual charge. It took about 70,000,000 gal. to flood the mines and about three months' idleness. But the fire was beaten. Now the water is out and it can be seen that the Junction North shaft has practically collapsed and that one of the Junction shafts has been rendered useless. The loss to the companies has been very great, as they have been bereft of a highly profitable lead market and have had to incur much expense in fighting the flames, in flooding and unwatering the mines, and in making good the damage done by both fire and water. The shares of the three properties mentioned are all largely held by the British public as the result of the incursion of Messrs. Bewick, Moreing & Co. into Broken Hill, and regret is felt that a check should have been administered to their enterprise. Before concluding this paragraph it is fair to state, and I hope equal publicity will be given to the denial as to the assertion, that the impression has now reached the stage of a certainty that the suggestion that the fire in the Junction mine was the result of overt

action by any dissatisfied persons was wrong. This is most gratifying to everyone. The Proprietary fire has also been got under control and the company is now engaged in turning out over 40,000 tons of ore per month —or as much as the whole of the other mines put together. It may be added that the company has just completed the first unit of its spelter plant at its Port Pirie smelting works. It is only a small affair—100 tons per week—but when the company gets the knack of the work and learns the best clay to use for its retorts, then other units will be added in quick succession. A self-contained organization, the company is relying on its own staff for skill.

A very interesting mineral discovery has been made at a wayside mineral district called Olary, on the way to Broken Hill. This is the striking of a formation carrying the rare mineral carnotite. The Government Geologist of South Australia (H. Y. L. Brown) writes of the find: "There are two lodes running parallel and from 5 to 15 yd. apart. The ore occurs as yellow and greenish incrustations and powder on the faces and joints, and in cavities of the lodes. It is visible along the outcrop at intervals, but best developed along some 50 ft. of the more solid and continuous portion, which has a thickness of from 24 to 42 inches. Judging from the persistent character of the lode itself, on the length of outcrop, and its width, where visible, I am of opinion that it will be found to extend to a considerable depth. From the fact that the carnotite occurs as incrustations, it appears most probable that it has been derived from the solution and re-deposition of other uranium compounds below, and therefore such ores will be found by exploitation at depth." A picked sample yielded vanadic oxide and 12% uranium oxide. The find is more curious than valuable.

Deep lead mining in Victoria just now is in the doldrums. What would give it a fillip would be for the big English ventures at Moorlort, controlled by Bewick, Moreing & Co., to get onto good gold. The firm has spent scores of thousands of pounds, only to learn the lesson to the full, that there is no royal road to get into a deep lead with its contained burden of water. It is pump, pump, and yet again, pump.

Work at the Moorlort mine has been abandoned to concentrate operations on the Loddon Valley mine, and an additional sum of £80,000 has been subscribed in London to go on with the work. The only feature that calls for comment in connection with the raising of this capital is that an estimate by Mr. Waldemar Lindgren on the value of gold in the wash was given out, apparently to induce subscriptions. Now, it can be most plainly affirmed that there is no local alluvial miner who would dare to estimate the worth of a deep lead from bores put up from the main level under the lead. Everyone wishes that the enterprise will turn out a huge success, but dependence on any estimate of the value of wash — even when it is cut up into blocks—is often most misleading and should for that reason be avoided.

The floatation of the Great Cobar mine and its allied ventures into a huge concern in London has been taken very quietly in Australia. The fact of the matter is that the syndicate which obtained possession of the Great Cobar mine has kept the good thing pretty well to itself. The members of the vending syndicate include Dr. Reid, Mr. Gould, formerly a prominent politician in New South Wales and now of the Federal Senate, and the brothers Longworthy. It is improbable that these men ever realized that they had such a prize in their grasp when the Sydney directors of the original Cobar company agreed to let them have the mine on tribute. The syndicate thought that the property could be worked in connection with coal claims held by Dr. Reid at Rix's Creek near Newcastle, New South Wales. In this assumption they were right and, as events turned out, they in addition got a great mine to work on a rising metal market. Then the syndicate nibbled in the majority of the shares in the company from which they held a tribute and so gained possession of the mine. As an illustration of how luck may go to one and not to another, it can be positively asserted that the syndicate had a narrow chance of missing the prize. Mr. Trewenack, a capable metallurgist, without being aware of the efforts being made by the syndicate to secure their tribute had been quietly sampling the slags and ore obtained by him at the mine. These showed the presence of gold in an appreciable quantity in the ore, besides the usual percentage of copper—a fact of which the directors of the original company appear to have been unaware. He got in touch with big capitalists and actually approached the company officials to try to get the mine on tribute but the board had gone too far and the next we heard was that an agreement had been signed. If he had acted a couple of weeks earlier, in all probability the fate of the Cobar copper mine would have been altogether different.

Salt Lake, Utah.

Stock Sold and Bullion Produced During the Past Month. The Honerine Mine Under Examination. A Discovery in the Daly. Park City's Output. Repairs in the Ontario Adit. Ore Shipments From Tintic.

The directors of the Mammoth Mining Co. have posted a dividend of five cents per share, or $20,000, payable on September 20. The ore and bullion settlements at Salt Lake City during August amounted to $2,423,000, the last week's portion being $596,000. During the month stated the sales of the Salt Lake Stock & Mining Exchange reached 1,010,112 shares, the same selling for $727,534.63. It is estimated that the output of gold, silver and copper-bearing bullion from the Salt Lake valley smelters during August aggregated close to 7,000,000 pounds.

The Utah Apex Mining Co., of Bingham, is pushing work on the lower terminal for the aerial tramway to operate between the mouth of the Andy tunnel and the Copper Belt railroad. With the tramway in operation, Mr. A. L. Pearse, the company's consulting engineer, says the management will be enabled to handle an output of 100 tons of ore daily, which will net $10 per ton. Information received from Gold Butte, situated in the extreme southeastern part of Nevada, states that the adit through which the Gold Butte mine is being developed has been run 275 ft. Important developments are expected within the next 100 feet.

Mr. E. W. Clark, manager of the Ophir Hill mine at Ophir, and a corps of assistants, has been conducting an examination of the Honerine mine at Stockton, which has led to the belief that the investigation is in the interest of Mr. W. A. Clark, of Montana, although owners of the mine refuse to confirm or deny it. —— What appears to be an important orebody has been opened on the 1,200-ft. level of the Daly mine at Park City. —— Development work will shortly be resumed at the Thompson mine at Park City. J. D. Wood, of Salt Lake, has been made manager. An effort is being made to operate through either the Daly-Judge or the Daly-West mine.

Ore shipments from Park City mines last week aggregated 2,543 tons. The shippers and amounts were: Daly Judge, 745; Silver King, 738; Daly-West, 500; Little Bell, 258; New York, 40: Ontario, 241; Jupiter, 11.——The output of the Little Bell mine at Park City in August was about 1,000 tons of ore. An air compressor, to operate ten drills, has been installed.——It is believed the task of unwatering the camp through the Ontario drainage adit at Park City, which has been closed by caves

for over eighteen months, is drawing to an end. Heavy timbers are being put in the cross-cut, this being done from the drift paralleling the main channel across which has been placed a door weighing one and a half tons, the latter being installed as a protection to workmen.——Important developments have been made in the Treasure Hill mine at Park City, which will soon become a shipper of ore.

The new compressor plant at the Yankee Consolidated mine in the Tintic district, replacing the one destroyed by fire recently, will be in commission in a few days.——Ore shipments from the Tintic mining district last week amounted to 128 carloads, or a little over 5,000 tons, the shippers and amounts being: Grand Central, 6; Victoria, 3; Carisa, 10; Mammoth, 7; Star Consolidated, 1; Black Jack, 1; Ajax, 2; Bullion Beck, 9; Gemini, 10; Centennial Eureka, 39; Scranton, 5; Dragon Iron, 8; Swansea, 4; Beck Tunnel, 2; Uncle Sam Con., 8; Eagle & Blue Bell, 2; May Day, 3; other mines, 4.——At the annual meeting of the shareholders of the Ohio Copper Co., N. J. Catrow was chosen president; A. J. Bettles, vice-president; Henry Catrow, secretary and treasurer, who, with J. S. Gard, J. H. Friend and Thomas Weir are directors. Mr. Weir is also manager. A bond issue of $650,000, the proceeds of which are to be used in the further development and equipment of the mine, was also authorized. The mill is to be enlarged. It is now treating 200 tons per day and making a saving of about 85 per cent.

Toronto, Canada.

Rich Discovery in the Nipissing Mine at Cobalt. Canadian National Exhibition.

The sensation of the last few days in mining circles has been the discovery of an extraordinarily wide and rich vein on the Nipissing Mining Co.'s property at Cobalt. Three weeks ago a new vein was struck near Vein No. 23. Where first discovered it was about 18 in. wide, when uncovered and followed it gradually widened until about the end of last week it was found by actual measurement to be five feet wide with an outcrop of almost pure silver. A large nugget weighing about 800 lb. was taken out, and is thought to contain 70% silver. Prof. W. A. Parks, of Toronto University, who was in Cobalt at the time, assisted in the measurement of the vein and vouches for the correctness of these details. The vein has been followed for a distance of 150 ft. The locality has been passed over by hundreds of prospectors since the camp was established, and the circumstances under which the find was made indicate that the thorough and systematic methods of prospecting pursued by large companies like the Nipissing, possessing abundant capital, must replace the crude and haphazard operations of the early prospectors before the real wealth of the district can be ascertained.

The Canadian National Exhibition opened here on August 27. The Temiskaming & Northern Ontario Railway Commission contributed a collection of ores and minerals from the Cobalt camp and neighborhood, which is attracting widespread attention. It is a representative display. The most conspicuous feature is three large nuggets from the Nipissing Mining Co.'s property weighing 485, 180, and 150 lb., of the respective values of $650, $300, and $250. Three bars of pure silver, weighing altogether 136 oz., are shown, the product of 90 lb. of ore from the McKinley & Darragh mine. Smaller pieces of ore are displayed from the Foster, University, Gilpin, Silver Leaf, Silver Queen, and other mines. The Ontario Government supplies four specimens of silver-copper-nickel ore from the recently discovered vein on the Gillies timber limit, and a slab of native silver from the Tretheway mine, valued at $500.

The Development & Finance Co., of London, England, has bought 13 mining properties in Wakefield and Templeton townships, near Ottawa, recently sold by the sheriff. —— A vein of cobalite has been struck by H. C. Barber a few miles southwest of Cobalt.

Cripple Creek, Colorado.

The August Output. Larger Tonnage. Increase in Milling Capacity. Cyanidation Gaining Ground. No Leasing at the Portland.

During August there was an increase of ore sent to the mills and a decrease of that treated by the smelters. The average yield of the ore was less, on account of the large proportion of low-grade stuff that was cyanided. The figures are:

Plant.	Tons.	Average value.	Total.
U. S. R. & R.	26,100	$27.50	$719,400
Smelters	7,500	80.00	600,000
Portland mill	9,500	26.00	247,000
Ironclad "	2,500	3.00	7,500
Anaconda "	1,500	4.00	6,000
Home Run "	600	12.00	7,200
Santa Rita "	100	7.00	700
Total	47,860		$1,583,800
Last month	46,442		1,665,500
Gain in tons			1,418
Loss in value			81,700

Two more cyanide plants will commence operation during September and two more in October, it being evident that cyanidation is gaining as against chlorination in the treatment of low-grade ores. The Santa Rita mine was drowned out during August and this shut off the supply of ore to the mill. It has a capacity of 50 tons per day. The cyanide plant of the Wishbone Mining Co., on Carbonate hill, will start this week, at the rate of 100 tons per day. The Pony Gulch mill is also nearly ready for business. The carpenters at the new Isabella mill have nearly finished their work. This plant has a capacity of 250 tons per day. It is likely that the Elkton, El Paso and Stratton's Independence will have their own mills—to treat dumps and low-grade ore—in the near future.

An authentic report to the effect that a rich strike of ore has been made in the Ida May property on Raven hill by the Cripple Creek & Fort Collins Mining Co., contracting for Beryl Tolman and associates, was received in the city by the latter the other evening. The lease is being operated through the Raven tunnel of the Elkton Co., and is 2,000 ft. from the portal at a depth of 700 ft. The Fort Collins Co. also has a lease on the Constantine claim in the same neighborhood.

President Irving Howbert, of the Portland Gold Mining Co., announced to *The Times* that rumors to the effect that portions of the Portland are about to be leased are erroneous. "You may state that absolutely no part of the Portland will be leased," said Mr. Howbert, "despite rumors to the contrary." The Portland is reported to be in excellent physical condition and living well up to its record of 10,000 tons per month.——One car of ore per day is being sent out from the Ophir mine, on Raven hill, belonging to Mrs. Anna Cone, of Canon City. This big production is stimulated by litigation pending with the Jennie Sample, and the grade of the ore is high, running from two to three ounces in gold.

New machinery is being installed on the Vindicator No. 6 property by Hamor and associates, lessees. A steam hoist and a boiler are being put up and will be in operation within a few days. At a depth of 65 ft. these operators have a six-foot body of ore that has shipped $60 per ton. Another lift will be sunk in the shaft, and it is the conviction of the lessees that with 100 ft. more depth, and corresponding development, the find will prove one of the best in the camp in several months.

Mining Summary.

ALASKA.

(Special Correspondence).—The Helvetia Gold Mining Co., on Windham bay, A. Giller manager, is opening up its mine and treating the ore in a mill owned by W. Ebner, situated near the former property.——The Alaska-Treasure Gold Mining Co., on Nevada creek, near Juneau, is developing its mine, and has on the dock near the mine a complete 20-stamp mill. A large amount of ore has been accumulated on the dumps. It is expected to have the mill ready for operation by October 15. F. M. Stone is manager and M. T. Hudson superintendent.——The Alaska-Perseverance Co., near Juneau, is expecting to start up the new 60-stamp mill in the latter part of September. John R. Mitchell is superintendent.——At Hadley the copper smelter is running full time on ore from the mine near the smelter. James Parker, of Seattle, is manager.

Juneau, August 25.

ARIZONA.

It is stated that two smelters will be built in the vicinity of Tucson, and if this is done, it will greatly benefit the mining districts in Pima, Pinal and Santa Cruz counties. One of the smelters is to be erected by the Mowry Mines Co. at Calabasas and the other is to be built by the Imperial Copper Co., which owns the Silver Bell properties—the largest in Pima county. Articles of incorporation were taken out a few days ago by the Imperial people, who will build their smelter either at Silver Bell (which is 30 miles from Tucson) or at Red Rock, which is about 25 miles from that city and just across the line in Pinal county. This smelter will have a capacity of 200 tons, and will be so designed that the capacity can be easily increased.

It is likely that a considerable quantity of fluxing ore will be shipped to this smelter from the mines in Tombstone, for practically the same people who are interested in the Imperial Company are in the Tombstone Con., which gives promise of making Tombstone the lively camp that it was 20 years ago.

This company is rapidly disposing of the water which flooded the Tombstone mines and made Tombstone a dead camp. Pumps have been arranged on the 700 and 600-ft. levels, and the water is now under control, and the main shaft is being sunk. The company is shipping ore steadily to smelters at El Paso.

The Twin Buttes Co., which recently completed a standard-gauge road from its mines to Tucson, has begun ore shipments. The returns from the first 15 cars averaged $238 per car, and the daily shipments bring about $500 net.

COCHISE COUNTY.

(Special Correspondence).—The Consolidated Mining Co., embracing the Mammoth and Republic groups, continues to ship one car of ore per day; about 25 white men to 15 Mexicans are regularly employed. The Dragoon Mining Co. is shipping about three cars of ore per week. About 30 Mexicans are employed.

Capt. Johnson, who recently bonded the May Flower claim with no surface showing of ore, after prospecting the claim by open-cuts through wash to formation, has been rewarded by discovering an orebody. An incline shaft 6 by 8 ft., 40 ft. deep, shows ore all the way for 23 ft. in a solid mass which averages better than 8% copper. One car of ore was shipped from this work and further developments and regular shipments will be made as soon as timber arrives to take care of ground which is unsafe. This is the largest strike made at this depth since the early days of the Peabody. L. Ezekiel is superintendent.

The Empire Copper & Gold Mining Co., owning 12 claims, is working a force of eight Americans. Mr. Brooks, the manager, claims to have good indications of ore in the several shafts and tunnels, and expects to encounter a body of shipping ore at an early date. —— The Michigan & Arizona Co., operating on the Copper Chief group, is sinking a double-compartment shaft which is at present 100 ft. deep. They have good showings of ore in several shafts and inclines, and some ore on the dumps. They expect to encounter ore in the development shaft at a depth of from 300 to 600 ft. Robert Mackay, the superintendent of the Black Prince Co., is pushing development work on that group. The Cochise Copper Co., operating on the easterly continuation of the Peabody group, is sinking a shaft (cage and manway compartment) on its property. They have attained about 150 ft., but are not yet through the wash, which covers the formation at this point. They expect to sink from 450 to 700 ft. before encountering the Silurian limestone, which usually serves as the foot-wall of the ore, at which point drifts will be projected. There are numerous prospect shafts on this property. The management claims no ore of commercial importance in sight. It is a close and well financed corporation, working in a manner necessary to good prospecting and development. Kirt L. Hart is manager; George M. Brown, superintendent.

Johnson, September 3.

MOHAVE COUNTY.

The Arizona-Mexican Mining & Smelting Co. is working a force at the Champion mine and getting rich lead ore. The company is to sink on this property, which was a big producer in the early days of the camp. Barney Perkins is preparing for a trip into the country south of Bill Williams fork, which is reputed to be rich in gold and copper ore, and prospectors from all parts are expected to be in there this coming fall and winter.——Wells Bros. have re-located the old I X L mine, in Wallapai mountains, and have been at work on it the past month. An adit was run to cut the vein at a depth of about 500 ft. and from this rich silver ore is being taken.——At Stockton hill there are now more men at work than in many years. The De la Fountaine mine is now being worked, and at the mill work is progressing rapidly.——At the Star Spangled Banner mine the Arizona-Mexican Mining & Smelting Co. is taking out rich lead ore. The mill is completed and will soon be in operation.——It is understood that there will be a consolidation of several of the large mines of Cerbat, and that later a reduction plant will be installed.——W. H. Taggart, of Los Angeles, has made a deal on the C. O. D. mine at Stockton hill.——S. A. Taylor is working four men on his mine east of Mineral Park. The orebody is said to be 14 ft. wide. The last carload shipment netted more than $2,000. A carload or more of ore is on the dump awaiting shipment to the smelter.

CALIFORNIA.

AMADOR COUNTY.

Only 60 stamps running at the Kennedy mill—the other 40 heads are laid up, partly through lack of a full force of men in the mine. Safety clutches are being adjusted to the skips in the main shaft. Another large compressor, to run 15 additional machine-drills, is being installed. At the Argonaut sinking has been resumed. The shaft is to be sunk 200 or 300 ft. deeper. The present depth is 2,400 feet.

DEL NORTE COUNTY.

(Special Correspondence).—Charles Grover, of San Francisco, who holds an interest in the Hostler Joe and Peacock copper claims on Shelly creek, has placed the property before some parties who are interested. Mr. Grover has refused a cash offer for it, preferring, with the assistance of friends, to develop it.——J. N. Britten, owner of the Hard Luck claims on Shelly creek, is planning to install a mill and mining equipment.

MONO COUNTY.

In the Pittsburg-Liberty group, near Bridgeport, a rich strike is reported in a shaft 40 ft. deep, the entire bottom of which is in ore.——In the Kansas mine, near Antelope, an eight-inch vein has been cut, the ore assaying $160 per ton.

NEVADA COUNTY.

Work has been started on the Lincoln mine, on Little Deer creek. A new shaft is to be sunk, under the direction of John R. Tyrrell.——At the Banner mine drifts are being extended on the 900-ft. level, and the shaft has been sunk an additional 50 feet.

SISKIYOU COUNTY.

The final clean-up for the season at the Lagrange hydraulic mine, west of Weaverville, amounted to between $150,000 and $160,000 in gold. Two other clean-ups were made earlier in the season, the first yielding $76,000 and the

second $32,000. The second clean-up was made on July 11 as an object lesson for several of the Eastern stockholders, who were then visiting the mine. The total for the season is over $240,000 in gold as the result of operating three giants since early in January. The shut down is made now because of the shortage in the water supply. Work cannot be resumed until the rainy season, when water will again be plentiful, which will be in December. This season's run was shorter than usual, because the heavy snows last winter made it impossible to open up as early as usual. The cost of operating the Lagrange this season was $60,000. The production of over $250,000 in gold leaves a wide margin of profit. Forty men are all that are required to operate the mine and attend to the long ditch, the reservoirs and the flumes. The Lagrange is often spoken of as being the greatest hydraulic mine in the world. The anti-debris law does not interfere with its operation, for the debris passes into the Trinity and Klamath rivers, along which there are no ranches that can be overflowed.

TUOLUMNE COUNTY.

L. Baum, having mining privileges on the Ida Klein ranch, two miles east of Jamestown, on the Algerine road, for five years past, has been pocket mining with indifferent success. A month ago he took as partners John McFarland and J. N. Lyon, of Stent. They installed a 10-h.p. gasoline engine and a pump, which now handles the water. Work was resumed in the shaft and in a few feet a rich streak 18 in. wide was found, the ore being liberally sprinkled with gold.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Red Oak Gold Mining & Milling Co. has sold its property on Democrat mountain to a group of Chicago capitalists headed by James A. and Elmer Bishop. Their expert examined the property about a month ago, spending a week at the mines, and the deal has just been closed. The purchase price is said to be about $300,000. The sale was effected through S. B. Wright, of Denver. The property is well known throughout the county, and comprises the Scepter, Sunburst, Stewart, and Aston lodes, which were heavy producers 25 years ago, with 15 other lode-claims and three millsites. There is a cable tram from the mouth of the Scepter adit to the bottom of the mountain, where there is a millsite belonging to the property, inside the town limits of Georgetown. The new owners intend to erect a concentrator with a daily capacity of 100 tons at once, as there are large bodies of lead and zinc ore opened in the mine; as well as the 18-in. streak recently opened up which assays high in silver.

The Central mine, situated in the southeast of Georgetown, and of which David Kennedy is owner and manager, has a shaft down 600 ft. From this six levels have been driven east and west, and out of it some $750,000 have been taken. The end of the 500-ft. level is 950 ft. west from the shaft under Leavenworth mountain, the breast of the level being 1,000 ft. below surface; in the last 200 ft. there is a body of copper pyrite five feet wide, which assays five ounces gold per ton and 17% copper. Mr. Kennedy is now driving an adit into Leavenworth mountain from the dump of the shaft. This is in 400 ft., and for the last 100 ft. there has been a body of quartz mixed with copper and iron pyrites four feet wide. This mills $28 per ton as broken in the adit, and when concentrated yields four ounces gold per ton. There is difficulty in obtaining ventilation so as to work the ore in the 500-ft. level. The driving of No. 3 level 400 ft. and connecting No. 5 with it would be too expensive.

The Capital Mining & Milling Co. cut the Ætna lode with its main adit this week; the lode is well defined between granite walls and shows three feet of iron pyrite with a four-foot body of vein-matter. The adit enters the base of Griffith mountain, its mouth being within the limits of Georgetown. The Ætna lode was cut at nearly 4,000 ft. from the entrance, at a depth of 2,000 ft. The company has now reached its objective point, and will commence exploiting the Ætna, Brittle Silver, and other lodes cut by the adit. The manager, William Cooper, has the confidence of his company and of the citizens of Georgetown, so it is expected that before many months he will have the mine on a paying basis.——The Manhattan Mining & Milling Co., operating the Kitty Ousley mine in East Argentine, has a drift 1,500 ft. on the vein south from the adit which cut the vein at 248 ft. from the entrance. There are 700 ft. of stopes. Ore is exposed for the entire length of the drift varying in width from two to five feet, chiefly galena. This orebody widens out to over eight feet in some places in the stopes. Steady shipments are being made over the Argentine Central railway, which has two tracks to the mine.

The Terrible mill, above Silver Plume, is now turning out 200 tons of concentrate per week from ore broken in the Terrible mine of the Whiting Mining & Milling Co. and the Smuggler mine of the Main Gulch Mining & Leasing Co. —— The foundation of the Diamond Tunnel & Corry City Co.'s mill at Silver Plume has been finished and the construction of the mill commenced. The mill will have a capacity of 300 tons per day when fully completed; a 150-ton section is to be finished by October 1. The mill will concentrate the material in the Diamond Tunnel & Corry City dumps, in which it is estimated there are over 1,000,000 tons of good mill dirt.

Georgetown, September 2.

LAKE COUNTY.

The Ætna shaft of the Glass-Pendery combination on Carbonate hill, Leadville, is down 720 ft. and will be continued to 850 ft. to the Parting quartzite, when lateral development will begin and be carried along that contact. This mine, one of the earliest locations of the district, was a heavy producer, but has not been worked since 1882.—— The latest strike in Leadville district is in the Leopard mine, at the head of California gulch, a property under lease to Dwyer & Co. The lessees have opened an 18-in. vein of high-grade ore at a depth of 130 ft. Machinery has been placed and the shaft will be put down 100 ft. farther, when a cross-cut will be driven to the vein, which lies 500 ft. east of the Sunday mine.——Eighty thousand tons of ore were hoisted and shipped from this district last month, and from present output, so far, the total for the month of August will aggregate 90,000 tons, which is nearly equal to the combined tonnage of all the other metalliferous mining districts of the State.

SUMMIT COUNTY.

(Special Correspondence).—James H. Myers, general manager of the Lenawee Tunnel Reduction & Transportation Co., has recently built a 20-stamp mill on the property and intends adding 20 more stamps before the end of the year. The plant consists of stamps, jigs, Huntington mills, Wilfleys tables and magnetic separators. For the time being water for the mill will be supplied from a well, but a pipe-line will be laid to the Snake river, which is said to carry enough water to develop several thousand horsepower. It is expected that several mining companies will join in the erection of a power-plant. The Lenawee company has a 300-ft. adit. This property was worked many years ago from the surface, but it has been practically closed down since 1893. The adit is to be advanced several hundred feet farther. The mill dirt is said to average $15 to $20 per ton, while the shipping ore runs at the surface $40 per ton. The company has recently taken over the Fisherman group of claims, consisting of 80 acres on which four veins have been opened, the principal one being opened by an adit 1,100 ft. long which shows an ore-shoot from 4 to 20 ft. wide. This property is about one-half mile from the mill, while the Lenawee tunnel has its portal at the top of the mill. The latter is situated about six miles from Keystone, the terminus of the Colorado & Southern Railway, and every effort is being put forth in this district to induce the railroad people to extend this branch to the mill, and eventually into both Montezuma and Argentine. The grade was started several years ago, but was abandoned for an unknown reason. Most of the grade has been completed as far as the junction of the two streams which form the Snake, and it is estimated that the track could be built at a nominal expense. Should the railroad continue its track to this district it will undoubtedly be the means of opening up many of the old abandoned mines as well as increasing the output from the already producing properties. The pipeline for the projected power-plant will be approximately

7,000 ft. long and will have a fall of 350 ft. This portion of the district was one of the best in the county until a few years ago, and at the present price of zinc and lead it is bound to come to the front again.——It is understood the Bullion group has been disposed of to the Guggenheims, who are contemplating extensive improvements on the property. A large amount of development work has been done on the mine.——The local mine owners have organized an association and are endeavoring to pull together for the good of the camp. They report a shortage of men. This is true of every part of Colorado; managers are unable to secure miners.

Argentine, September 1.

(Special Correspondence).—There is an increase of activity in this camp. The New Pennsylvania Mines Co. is shipping two cars of ore per week and hauling the ore to Keystone, about ten miles distant. W. B. LeWald made the statement that as soon as the railroad would complete its line he was in a position to double the capacity of his mill. Several stockholders of the Pennsylvania company have been visiting the property and seemed well pleased with conditions.——The Rothchilds Gold & Silver Mining Co. has been operating here for years and is still driving an adit, now about 4,000 ft. long, and it is estimated that within the next 300 ft. the mother vein of Cooper mountain will be cut. The Tariff and Rothchilds are the two main veins and from indications on the surface they have apparently come together. Already 32 minor veins have been intersected; some of these give good assays, but the object of the adit is to tap the two main lodes, which at the surface are 15 to 24 ft. in width. This company is also considering the erection of a mill for the treatment of the ore which now has been opened up. Thomas R. Webb, formerly with the Gold Pig mine in San Bernardino county, Cal., is general manager of the Rothchilds property.

Argentine, August 31.

(Special Correspondence).—A good deal of work is being done in the Ten Mile district and especially at this particular point. The King Solomon Tunnel & Development Co. has cut four veins in the first 800 ft. of their adit, but it will be necessary to drive several hundred feet further before encountering the main lode. This company is considering the advisability of a power-plant on the Ten Mile river, which flows past the property. As both the Denver & Rio Grande and Colorado & Southern tracks are available, the shipping facilities are most convenient. Sam H. Alexander, secretary and fiscal agent of the company, of Madison, Wis., is on a visit to the property. F. C. Dinsmore is president and W. W. Theobold treasurer.——The Mary Verna mine was closed down a few days ago, but it is expected to resume operations shortly.

Frisco, August 31.

TELLER COUNTY.

A shipment of ore sent out from El Paso mine the latter part of last week gave returns of $8,000, or five ounces per ton gold. There were three cars of this grade. Ore is coming from the Little May and Beacon Hill-Ajax claim, where work is being prosecuted by the company in addition to efforts of lessees in both claims. Recent developments in El Paso warrant the belief that enough ore has been found above the 600-ft. level, to which point the water has risen in the shaft since the recent influx, to keep the property producing steadily until the completion of the drainage tunnel which, if begun immediately, will be completed inside of three years.——A strike has been made by Bower & Beard, operating in the Glorietta shaft of the Vindicator, formerly belonging to the Hull City placer. These lessees are now working with two machines in a nine-foot orebody on the 100-ft. level, 80 ft. south of the shaft, returns on the initial shipment being at the rate of $40 per ton. All the ore is being run through a washer.

IDAHO.

(Special Correspondence).—F. Augustus Heinze's hand is again seen in a number of mining deals closed the latter part of August, but, of course, the gentleman from Butte makes denial that he is interested in any other than the Stewart property, which he bought some time ago. However, there are persistent reports and rumors that Heinze's agents have secured options on a number of good things, one of them being the Cooney group in the Cœur d'Alene district, east of Spokane. The Cooney group was at one time bonded to W. A. Clark for $160,000, but when the first payment became due the Montana senator and his associates passed the deal up. Mark Cooney says that Heinze is after the property. There is also a report that he has a four months' option on the Rex mine, the amount involved being $400,000. The bond is in the names Fred Kratzer and Charles McKinnis.——Thomas L. Greenough, of Missoula, Mont., president of the Snowstorm Mining Co., announced in Spokane a few days ago that the mine near Mullan, Idaho, east of Spokane, will pay dividends at the rate of at least 20% per year in the future. The question of distributing six cents a share, or $90,000, this month, he added, is dependent upon whether the dividend can be legally declared after the re-organization of the company.

Increases in the gross value of 65 mining stocks dealt in by the Spokane Brokers' Exchange for the week ended September 1, are placed at $1,142,375. Rambler-Cariboo heads the list with an increase of $210,000, Amador being second with $100,000, and Panhandle Smelter with $50,000.——The Monument Gold Mining Company, a Missouri incorporation, is doing considerable work at Roosevelt, Idaho, northeast of Spokane. Three shifts are employed and the cross-cut tunnel is now 520 ft. from the portal. It will be driven 200 ft. more to cut the main vein. Joseph M. Venable is manager of the property.

Word has been received in Spokane from Washington, D. C., that the Department of the Interior has ordered the surrender of the patent to the Leonard claim, in the Cœur d'Alene district, issued to E. H. Moffitt, R. K. Neill and C. J. Morse, as the result of a long-standing dispute over the rights of that and the Nilus claims, owned by Dr. D. H. Brien of Spokane. Brien alleged that the surveyor moved the ground lines of the old Leonard north about 600 ft. so as to cover the Nilus claim. Brien is now planning to get a perfect title to the Nilus, upon which he has been keeping up his assessment work.——D. C. Corbin, of Spokane, head of the Spokane International railway, has sold control of the Iron Mask mine, in the Rossland, B. C., district, to the Consolidated Mining & Smelting Co., the price being $80,000. The mine was located 12 years ago and incorporated by Spokane men, and has paid at an average of $100,000 a year. The buyers will make extensive improvements and develop the property.

Jay P. Graves, president of the Inland Empire Railway Co., is financing the Holden mine, on Lake Chelan, Wash., west of Spokane, and its owner, J. H. Holden, has put on a large force of men to do extensive development work. It is announced that a smelter will probably be erected to treat the ore.——The Ross mine, near Troy, Idaho, has just sent a car of pure mica to Spokane for treatment. The property is owned by T. A. Williams and his associates. The company has erected a warehouse in Spokane and it is given out that extensive developments will follow.——John Wentworth, president and general manager of the Copper World mine, on Palmer mountain, near Loomis, Wash., received advices in Spokane today that a strike of importance has been made at the bottom of the shaft, the find being of solid sulphide ore. Herome Drumheller and Mr. Wentworth are the chief owners in the mine.

The Federal Mining & Smelting Co., organized by Charles Sweeney, formerly of Spokane, but now of New York, has just declared a dividend of 1¾% on preferred, the regular quarterly dividend, and a regular quarterly dividend of 1½% on common, with an extra dividend of 2½% on common, aggregating $457,250.——The Belcher Mountain railroad, just completed, north of Spokane, has received contracts to handle 500 tons of ore daily from the mines in the Belcher Mountain district.——Ten miles of ditches will be run in the Pierce City district in Idaho, east of Spokane, by C. T. McClintock and his associates, who have just secured control of the Blue Bell, Blue Streak, and the Home groups of placer claims on Muscellshell creek. An elevator will be installed to handle the gravel.

Spokane owners are arranging to install half a dozen concentrating plants in Metaline camp on the lower Pend

d'Oreille river, in Idaho, northeast of Spokane, and the indications are the district which has been idle more than 20 years will resume great activity. C. H. Larsen, mining expert for Peter Larsen, has made contracts for the handling of 300 tons of ore a day, beginning January 1, 1907.—— The Dominion Copper Co.'s Idaho mine, north of Spokane, has sent its first five cars of ore to the Trail smelter, controlled by the Canadian Pacific Railway. A new style air-compressor plant of 25 drills capacity is being installed on the Idaho mine.

Spokane, September 3.

SHOSHONE COUNTY.

(Special Correspondence.)—The Frisco mine, at Gem, has resumed operations on September 1 after a long idleness. Gus Ehrenberg is superintendent.——At the Snowstorm mine, near Wallace, it is expected to resume milling soon, under superintendency of W. H. Myers.

Wallace, September 1.

Judge James H. Beatty, of Boise, sitting in the United States Circuit Court, has denied an application for an injunction against the mining companies operating mills in the Cœur d'Alene district against allowing the refuse of their concentrators reaching the waters of the Cœur d'Alene river. The suit was instituted by Timothy M. McCarthy and 60 ranchers owning farms in the valley of the river. It is understood they will take the matter to the United States Circuit Court of Appeals. Judge Beatty declares that to grant the petition would mean to close every mine in the district.

Four more 'tailing' suits have been filed at Wallace, inaugurating another chapter in the litigation resulting from the alleged destruction of land, crops, and animal life below the concentrators by the pollution of the water of the stream by the waste matter from the mills. Of the cases just begun, Josiah and J. S. Hill, of Wardner, jointly have filed two suits, one against the Empire State-Idaho Mining & Developing Co., now owned by the Federal Mining & Smelting Co., praying for $12,000 damages; and another against the Standard Mining Co., also a Federal property, for $12,000. In all, they claim to own about 69 acres of land near Kellogg, worth primarily $200 per acre. They claim the land has been damaged to the extent of $24,000. The Hills already had similar suits pending against all the mining companies with mills east from Kellogg. The other two suits were filed by Mrs. Mathilde Matheson, who wants $5,000 from the Empire State-Idaho and also from the Gold Hunter Mining and Smelting Co., of Mullan. The allegations in these cases are similar to those filed in times gone by.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The prediction of a boom in Searchlight this fall is fast coming true, as is proved by the unusual activity here, due largely to the substantial progress made during the summer in the mines, but the construction of the Barnwell & Searchlight railroad also has had a decided effect. —— The Quartette Mining Co. has been paying dividends of $15,000 per month, which will doubtless be doubled when the 20 additional stamps, now on the ground, are dropping. Two 50,000-gal. tanks have been placed on a high point between the mill and the shaft, and are used for the storage of water pumped from the Drake shaft. One of these will be kept full for fire protection. A fine orebody has been opened on the 800 level. The breast is in 500 ft., and shows a solid face of copper and iron-stained ore that assays $30 per ton in gold and 10% copper. One hundred feet back from the face the ore for two sets assayed over $100 per ton. As the orebodies have widened with progress downward and eastward, it is expected that the 800-ft. level will prove better than those above it. —— The Annette Mining Co. is enlarging and timbering its shaft to the present depth of 58 ft. The shaft is all in ore, which assays well. Besides copper-stained ore, which is predominant, some galena is found. —— The Santa Fe has struck a large body of ore assaying $20 per ton on the 200-ft. level. The strike was made while driving the north drift on the second level, about 400 ft. in from the shaft. Neither the hanging nor the foot-wall has been found. Apparently a new ore-shoot has been discovered. —— A nine-year old boy picked up a 13 oz. gold nugget which the rain had uncovered within 100 ft. of Crescent postoffice.——In the Searchlight Western mine, in cross-cutting on the 150-ft. level, a body of sulphide ore was found assaying from $4 to $12 per ton. This is the first time sulphide ore has been found in quantity in this locality. The rock is greenish quartz-porphyry. —— The Gold Dyke Mining Co., which adjoins the Pompeii on the west, will soon resume active operations. The 103-ft. shaft will be sunk to the 200-ft. level and the property thoroughly exploited. It has a 60-ft. cross-cut passing through a vein 20 ft. wide, from which samples assaying $2 to $50 per ton have been taken.

Searchlight, September 1.

NYE COUNTY.

(Special Correspondence).—From present indications, the Manhattan district will be not only a gold producer, but will also output copper. The Toquima Copper Co., owning property five miles east of Manhattan, is sacking copper ore worth $100 per ton. Properties adjoining this copper strike are at work, and some with good results. This portion of the Manhattan district is rapidly coming to the front in the production of ore. —— Nearer town, the Manhattan Mammoth and Consolidated Manhattan companies are at work on the same gold-bearing veins. The Manhattan Buffalo is working steadily, with the hoist in constant operation, and good ore has rewarded the efforts. —— Near at hand, the Consolidated Extension is blocking out orebodies of good grade, and laying aside large amounts of milling ore, awaiting the erection of the custom mill which has been contracted for. Adjoining it, the Manhattan Con. has installed machinery for deep mining. The Mother Lode Co. is driving its adit, opening up a number of ore-shoots that traverse that property. —— The Cowboy mine is looking well, and the rich vein encountered in the drift from the shaft is widening. The vein consists of oxidized quartz of reddish color, similar to the ore of the Consolidated, which was rich in gold. —— The Manhattan Whale, on a continuation of the Cowboy vein, has a body of milling ore which it is blocking out.—— The Union No. 9 of the Manhattan Dexter, and the Little Gray have large bodies of milling ore, and the lessees are doing well, working night and day. —— At Central, the Manhattan Nevada Gold Mines Co. is pushing work in the adit on its Georgey group, and have three veins, all carrying gold. A new vein has been encountered in the face of the tunnel, samples from which assay $20 per ton gold. —— On the Manhattan Nemo, adjoining the Georgey on the west, a vein of gold and silver ore was encountered a day or two ago which assays $100 per ton. This strike was made at a depth of 75 ft. in the shaft. —— Specimens of free gold ore have been exhibited from the property of the Manhattan Paymaster Mining Co., three-quarters of a mile northwest from Central. A vein of high-grade ore has been encountered, and the ore is being sacked.

Manhattan, September 1.

The new town of Monarch is 15 miles east of Manhattan, and five miles south of Belmont. Good water is said to be abundant three miles from the camp. Contracts have been let for the construction of numerous stone, brick and frame buildings. The town lies between Belmont and Hunt's canyon, and close to the junction of the Ralston and Monitor valleys. The biggest mining proposition in that region is said to be a dike showing copper, gold, silver and lead.

WHITE PINE COUNTY.

The site for the smelter of the Nevada Con. Copper Co. has been decided upon, a suitable place having been found on Duck creek, 20 miles nearer the main line of the Central Pacific railroad than the mines. On the tract of land selected for this purpose is a large amount of first-class limestone suitable for flux, which partly decided the management in its choice of the site. It also gives the company the advantage of a large stream of water necessary in its metallurgical operations.

NEW MEXICO.

Mining conditions throughout New Mexico are excellent, according to the Santa Fe *New Mexican*. The Carpenter district in Sierra county is coming to the front with zinc and

lead. The Magdalena district is now among the big zinc producers of the country. Tres Hermanos district, 25 miles south of Deming, shows considerable development work in zinc properties recently found. There is renewed life near Estey City, in the southeastern part of the Oscura mountains. In the San Andres mountains some copper properties are being developed by Eastern capitalists and are making a good showing. These are in Socorro county. The Lordsburg mining district is shipping from three to five carloads of ore per week. The ores in the Lordsburg district are mostly silicious and heretofore have been costly of treatment. Freight rates on this class of ore to the Douglas and El Paso smelters have been reduced, which has enabled the owners to get to these smelters with their ore and receive higher returns. The promise of the United States Treasury to purchase 100,000 oz. silver per week for coinage will help the silver producing section of Sierra, Grant, and Santa Fe counties.

SOCORRO COUNTY.

The Mine Development Co., with headquarters in Socorro, has purchased the Stonewall Jackson group of mines, in the Magdalena mining district. The group consists of three claims. The ore carries lead and zinc, and development has placed several thousand tons of ore in sight. The Mine Development Co. now has the largest area of mineral land in the district.

SOUTH DAKOTA.

LAWRENCE COUNTY.

The Homestake Co. is now operating 240 stamps on the north end of the property by electric power generated at the new power house, at Englewood, 12 miles distant. The company is preparing to generate electricity at other points. The plant at Englewood utilizes the water pumped over the divide from Spearfish creek. It is piped four miles, and is delivered to the turbines under heavy pressure. The plant has a rated capacity of 600 h.p.——The Minnesota Mines Co., at Maitland three miles west of Deadwood, has commenced the construction of a large cyanide mill, and will increase the working force to complete the plant at the earliest possible date. The company is developing a water supply in Elkhorn gulch, where a dam is being built. It owns an excellent millsite on False Bottom creek, opposite the Maitland mill. After three years of exploration the company has developed sufficient ore to warrant the erection of a mill. The ore is the characteristic quartzite and shale of the district and an extension of the formation which has been profitably explored in the Maitland mine. ——It is reported, on good authority, that the Tinton Co., at Nigger Hill, will resume work early in the fall. A payment on the purchase price was due July 1, and the owners granted the company an extension of time. It is said that the company is securing additional acreage and that when work starts it will be on a larger scale than has been attempted heretofore.——J. Welch and associates, who have a lease on the Esmeralda mine in Blacktail gulch, near Deadwood, are meeting with success. The mill is handling 30 tons per day, and as the gold is practically all free-milling, little trouble is experienced in making a good recovery. ——J. B. Heath, of Rochford, has bonded his group of mines, near the head of Irish gulch, to Eastern men, who made a part cash payment. There are several veins on the property carrying auriferous mispickel. The property is partly developed. Mr. Heath is in charge of the mines and their development.

The Hidden Treasure Mining Co. is installing machinery at its mine in upper Deadwood gulch, including a gas-engine, compressor, and hoist. The main shaft is down 200 ft.——The Columbus Con. Co., owning a large area north of Central City, which is in line with the northerly extension of the Homestake belt, is negotiating for the property of the Hidden Fortune near the De Smet mine, on the opposite side of Deadwood gulch. The property includes a 60-stamp mill, situated three miles below Deadwood.——The Gilt Edge-Maid mill, in Strawberry gulch, is treating 180 tons of ore per day. Mining is accomplished by the mill-hole and open-cut system. Underground, an electrically-operated hoist is in use sinking a shaft below the adit level. O. P. Ankeny is superintendent.

UTAH.

BEAVER COUNTY.

The Majestic Co. is shipping a carload of copper ore daily from its Old Hickory mine to the United States smelter, netting between $300 and $400 per car. From these shipments the company is meeting all its development costs. The management has installed a pump on its Harrington-Hickory property and has resumed the sinking of its shaft.

WASHINGTON.

FERRY COUNTY.

The townsite question of Keller has been settled, and many transfers of lots have been made.——The Umatilla, one mile north of Keller, has put on men under J. King. This property is owned by Spokane and Medical Lake people.——The Gold Cord mine is running a cross-cut from the lower adit to the bottom of a winze in which is three feet of good ore. The cross-cut is in 30 ft. The work is under the direction of W. J. Elmendorf, of Spokane.——The Bridge Creek Mining Co., an Eastern concern, is operating a mile north of the Congress nickel property, on Bridge creek. A cross-cut is being driven to cut the main orebody at a depth of 400 feet.

OKANOGAN COUNTY.

The Twisp River Copper Mining Co. has struck ore in its Index group near Camp Gilbert. The vein is 4 ft. wide.—— The Cascade Mining & Milling Co., with a capitalization of $1,000,000, has been incorporated by James M. Scott et al. to exploit the Cascade group on Sweat creek.——J. C. Harklerode reports striking gold on the Toledo placer claim, where he has expended $1,200 in ditching and has a large stream which is carried two miles by ditch and flume. Johnson & Robbinette, who have a claim one half mile south of here, have been working all summer. They have 1½ mile of ditch, and work their ground by hydraulic method.

SPOKANE COUNTY.

(Special Correspondence).—Frank MacKean, an engineer in the employ of the Hydro-Electric Co., of Chicago, is in Spokane inspecting the old Spokane smelter, five miles down the Spokane river, with a view to putting it into operation. The property is owned by Scott E. McCrady, of Grand Rapids, Michigan.

Spokane, September 1.

WISCONSIN.

The Mutual Prospect Co , which has had a prospecting drill working near Boscabel, is reported to have struck five feet of solid lead ore at a depth of 20 feet.

CANADA.

BRITISH COLUMBIA.

Following are the shipments for the week: Centre Star, 1,830 tons; Le Roi, 2,280 tons; Le Roi No. 2, 600 tons; White Bear, 220 tons; total for week, 4,930 tons; for year to date, 211,043 tons. At the Trail smelter 6,658 tons of ore were received during the week. In addition to the shipments received from Rossland, ore was sent in as follows: North Star (East Kootenay), 225 tons; Snowstorm (Larsen, Idaho), 101 tons; Iron Mask (Kamloops), 85 tons.

The management of the Hall Mining & Smelting Co., Ltd., states that owing to increase in shipments of ore, and the shortage of labor, it is behind with the unloading of ore, and for some time past have been under considerable expense for demurrage. A few days also are required to make some changes in the sampling mill, which will increase its capacity, and therefore it asks shippers to defer making any further shipments until after the first of September. For the past five weeks the Nelson smelter has undertaken to handle the whole output of the St. Eugene mine, so as to enable the Trail smelter to make some alterations. Very early in the month the big furnace went out of commission and a complete renewal of the crucible was found to be necessary. As a consequence, the storage capacity was exceeded and the sampling and crushing plant was overtaxed.

The winze in the Le Roi mine has reached 1,750 ft., this being the greatest depth attained in the Province. The shaft, which has five compartments, will be sunk further, to 2,000 feeet.

Personal.

F. L. BOSQUI is at Denver again.

WILLIAM DE L. BENEDICT is at Oroville.

F. F. Sharpless is in western Chihuahua.

GEORGE P. GOW has returned from Nevada.

W. H. STORMS has been on a visit to Los Angeles.

H. L. LEWIS is on his way from London to Peru.

W. P. NOBLE is on his way from Leadville to Chile.

G. RIOTTE is in charge of opal mines in Queretaro, Mexico.

R. J. MATCHETT left Liverpool on August 16 to go to Tierra del Fuego.

O. H. FAIRCHILD is now manager for the Triangle Mining Co. at Leadville.

H. D. BODDING, from London, is examining mines near Chihuahua, Mexico.

W. E. DEFTY will be in Sonora and Sinaloa until the middle of September.

L. B. DAVENPORT is with the Squaw Creek Mining Co., at Gazelle, California.

CARLOS F. LANDERO, of Pachuca, has been on a visit to Guadalajara, Mexico.

JAMES W. NEILL passed through San Francisco on his return to Salt Lake City.

H. L. JOHNSON is manager of the Oriental Mining Co., near Alleghany, California.

JOHN HAYES is superintendent of the King Con. Mining Co., at Loganville, California.

R. J. FRECHEVILLE passed through San Francisco on his way to London, from Japan.

A. W. MCCUNE is expected in New York on September 20 from Cerro de Pasco, Peru.

W. C. WEST is manager for the Black Peak Gold Mining Co. at Hillsboro, New Mexico.

FRANK G. STEVENS is general manager of the San Pablo Mining Co., in Jalisco, Mexico.

O. E. JAGER is in charge of the blast-furnace plant of the Arizona Smelting Co. at Humboldt.

FRED. J. SIEBERT, on his return from London and Glasgow, has gone to Tonopah, Nevada.

J. A. COOPER has been appointed manager of the Richfield Mining Co. at Tuape, in Sonora, Mexico.

WALLACE BROAD, formerly mining adviser to the Chinese Government, is returning to China and Japan.

JOSEPH LUXON has resigned the superintendency of the Cyrus Noble Mining Co. at Searchlight, Nevada.

W. T. R. COWELL, manager of the Barranca de Cobre mines, has returned to Chihuahua from New York.

FAYETTE A. JONES, of Albuquerque, New Mexico, is examining the placer beds near Cerrillos, New Mexico.

F. X. O'BRIEN, manager of the Homestake mine in Yavapai county, Arizona, is on a visit to Los Angeles.

CHARLES GARVIN has been made general manager for the Green Mountain Mining Co. at Silverton, Colorado.

LOUIS A. CATES, mine manager for the Boston Con. Mining Co., has returned to Bingham, Utah, from the East.

S. A. WORCESTER, of Victor, has returned from doing professional work at Central City and Idaho Springs, Colorado.

NEIL COCHRANE, recently in British Columbia, is now manager of the Jumper mine in Tuolumne county, California.

HORACE A. MORSE, president of the Sovereign Mine Co., in Sierra county, Cal., has returned to the mine from St. Louis.

F. L. BELLAMY has resigned the management of the Mariposa mine, at Taviche, and he is now at Oaxaca, Mexico.

THOMAS J. HENEY, of Spokane, has been appointed foreman of the Tamarack & Chesapeake mine, in Tiger Peak district of Idaho.

EDWARD D. MCDERMOTT returned from Japan on the *American Maru* and spent a few days in San Francisco before proceeding to England.

G. A. DENNY has arrived at London. He expects to open an office for consulting practice, having resigned his important position at Johannesburg.

R. P. McLaughlin, formerly engineer for the Standard mine at Brodie and now deputy mineral surveyor at Manhattan, Nevada, is visiting San Francisco.

W. H. WEED, E. O. HOVEY and A. P. COLEMAN were among the adventurous spirits who climbed Colima, and were (according to our sensational daily press) singed by the volcano.

R. D. SALISBURY, professor of geology in Chicago University, spent several days at Alma, Colorado, inspecting the Snowstorm Hydraulic Co. property and will also make a trip to the San Juan before returning to Chicago.

C. H. MACNUTT and E. C. VIGEON have left the Societe des Mines de Cuivre de Catemu, Chile, to take up the management of the Sociedad de Minas de Cobre de Cutter Cove in the Straits of Magellan, in addition to general consulting work.

ROBERT P. MULOCK, of Colfax, Iowa, one of the pioneers of the Lake Superior copper district, is at Calumet, Mich. He was present when the first blast was fired in the Calumet conglomerate by E. J. Hulburt. Mr. Mulock was actively identified with copper mining in Ontonagon county 50 years ago.

Obituary.

JOHN MCQ. FRENCH died at Denver, Colo., on August 29, of appendicitis. At the time of his death Mr. French was local manager for the A. Leschen & Son Rope Co. He had been with the Leschen company about three years. Prior to that time he was engineer with E. K. Smoot on harbor work in Mexico.

Dividends.

On September 6 the BUNKER HILL & SULLIVAN MINING & CONCENTRATING Co. paid dividend No. 108 of $180,000. This makes the total paid since January 1, 1906, $1,620,000, and total to date $7,146,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, September 5.

Con. Virginia	$0.91	Manhattan Con	$0.93
Ophir	3.40	Jumping Jack	0.44
Savage	1.00	Midway	2.23
Tonopah Ex	5.56	Montana	2.88
Belmont	5.17	Mohawk	3.50
Jim Butler	1.41	Silver Pick	0.58
Jumbo	1.27	Sandstorm	0.78

ANGLO-AMERICAN SHARES.

Cabled from London.

	August 30. £ s. d.	September 6. £ s. d.
Camp Bird	1 6 9	1 7 6
El Oro	1 13 0	1 10 6
Esperanza	3 2 6	3 3 9
Dolores	1 13 9	1 11 3
Oroville Dredging	0 18 9	0 18 9
Stratton's Independence	0 4 6	0 4 0
Tomboy	1 4 4½	1 4 4½

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending August 30.	Average Prices for Week Ending September 6.
Copper—Lake (cents per lb)	18¾	18.825
" Electrolytic "	18⅝16 @18⅝16	18½ @18 11/16
" Casting "	18 @18⅛	18¼ @18⅜
Lead "	5.75	5.75
Spelter "	6.025	6.05
Silver (cents per oz.)	66¾	67⅜

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

THE day-fly has better grounds for calling a thunderstorm supernatural, than has man, with his experience of an infinitesimal fraction of duration, to say that the most astonishing event that can be imagined is beyond the scope of natural causes.

SINCE 1851 to the end of March last, Victoria has produced 68,558,132 oz. of gold, valued at $1,328,853,663. The gold yield for the first quarter of the present year was 190,729 oz., and the dividends paid by mining companies amounted to $635,563.

OF its yearly production of aluminum, estimated at above 10,000,000 lb., the Pittsburg Reduction Co., apparently exports but little of the metal. During June there was shipped from the United States aluminum valued at $40,364, bringing the year's total up to $318,-531. Estimating the average price of the metal at 33c. per lb., the exports were only 965,250 pounds.

STEAM FOR ROCK-DRILLS. Where such drills are close to a boiler, steam may well be used, especially where the work is not underground; when the steam is not condensed, it may easily make the workings cloudy. The longest tunnel which has been driven by the use of steam for machine-drills is probably the Magna Charta at Tomichi, Colorado, where the 1.25-in. steam-pipes ran for 3,000 ft. from the boiler to the drills at the face of the tunnel. As the work progresses, the boiler-pressure was gradually raised from 80 to 100 lb. per sq. in., but after 3,000 ft., an air-compressor, driven by water-power, was put in in place of the steam installation.

ROLLS make less dust or slime than stamps, and are cheaper in first cost and erection. If ore is to be leached, then crushing by rolls is to be preferred, since it gives a more granular product through which the percolating solutions can pass more readily. If, however, the ore is to be amalgamated this is a matter of less importance, and, on the other hand, gold ore can be more finely crushed by stamps than by rolls. Of late, in cyanide practice, it has been found profitable to stamp the rock coarsely, classify the product into sand for re-grinding, and to save the overflow or slime for direct treatment. In this way the whole product of the mill is so finely comminuted that the extremely fine and intimately distributed gold particles become accessible to the cyanide solution. Such particles could not be recovered by amalgamation at all.

THE first mill on the Homestake lode was a custom-mill of 35 stamps. It stood near the great open-cut in Lead. The first mill erected by the Homestake Co. was one of 80 stamps. This was built in 1878 and was known as the Homestake mill. The Golden Star mill of 120 stamps was built the following year, and the Highland mill of 120 stamps was erected in 1880. The Deadwood mine at Terraville was owned by a separate corporation that built a 60-stamp mill. The Golden Terra, another individual company, also owned a 60-stamp mill at Terraville. These two mines were in later years consolidated as the Deadwood-Terra. The first mill of the Caledonia Co. was situated near Central City, some distance from the mine. In 1880 a 60-stamp mill was built at the mine. The Father De Smet mine was at first equipped with a 10-stamp mill. In 1878-'79 this was replaced by one of 100 stamps. All of these mines and mills are now included in the Homestake consolidation. Each of the mills except the De Smet (now Mineral Point) has been enlarged, the six mills now containing 1,000 stamps crush 4,000 tons of ore per 24 hours throughout the year.

REGULAR FEED of ore in a concentrating mill is of supreme importance, since, not only do the machines run better, but they do better work, and produce better concentrate of a more even grade and with less loss in the tailing. Regularity of feed is closely associated with regularity of speed. First of all, therefore, see that the rock-breakers are fed with unvarying regularity, as with them the ore-stream starts. If they are fed intermittently, then the work right through will be intermittent—at one moment the trommels and elevators will be running light, and at another they will be overloaded. This again affects the feed to the jigs, so that they will have at times too much to do, and again too little, and so will be doing poor work. The remedy is to put a careful man at the rock-breaker, and to insist on the principle of feeding—little and often—and you may be sure that it will greatly benefit milling operations.

A CORRESPONDENT writes to say that he is treating, by cyanidation, an ore that contains pyrite in a state of oxidation, and in consequence the cyanide solutions become greatly reduced. His test is to acidify with sulphuric acid and titrate with potassium permanganate.

The reply, prepared by a recognized authority, is as follows:

In solutions acidified with sulphuric acid, potassium permanganate is decolorized by many reducing agents, the reaction being essentially a withdrawal of oxygen from the permanganate acid set free.

$$KMnO_4 + H_2SO_4 = HMnO_4 + KHSO_4$$
$$2HMnO_4 + 2H_2SO_4 - 5O = 2MnSO_4 + 3H_2O.$$

In titrating working cyanide solutions the decolorizing effect on permanganate (acid being first added) is as a rule principally due to thiocyanates (sulphocyanides) as KCNS, but may also be caused by ferrocyanides or even sulphides. The relative volume of deci-normal $KMnO_4$ thus reduced is sometimes taken as a measure of the 'reducing power' of the solution.

Besides the substances usually regarded as reducing agents, there are several compounds which act as oxidizing agents but still have the same effect on permanganate. For instance, it is decolorized in acid solution by hydrogen peroxide, and by substances which yield hydrogen peroxide in addition to acid, such as the peroxides of alkali and alkaline earth metals (Na, Ca, Mg) and percarbonates, perborates, etc. These unstable substances themselves tend to give up oxygen, each atom of which takes another oxygen atom from the permanganate to form a molecule of O_2.

$$3H_2O_2 + 2HMnO_4 + 2H_2SO_4 =$$
$$2MnSO_4 + 6H_2O + 4O_2.$$

Permanganate thus gives the most convenient method for estimating oxidizing agents of this class. If, therefore, substances of the peroxide class are added to cyanide solutions before testing the 'reducing power,' the permanganate consumed is due to the combined effect of the oxidizing and reducing agents present, because thiocyanates are practically unaffected by peroxides in dilute alkaline solutions. As a matter of fact a cyanide solution showing a high 'reducing power' by this test is not necessarily in bad condition for working purposes, so long as the effect is not due to sulphide. Excellent extractions may be obtained with solutions containing comparatively large percentages of thiocyanate, provided other conditions are favorable.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

A Point of Law.

The Editor:

Sir — A broker secures an option on a mining property and submits the proposition to a prospective buyer, who sends his engineers to the place for examination and report. The engineers refuse to recommend the purchase on account of terms and conditions, and, with the consent of the broker, take up the matter with the agent of the property direct. In the meantime the option granted the broker expires, but the purchase of the property is consummated. The agent declines to recognize the broker's right to a commission. Has the broker a legal right to a commission? The entire transaction was brought to a close within less than thirty days.

The parties interested by the broker also buy another mine from the agent — one adjoining the mine above referred to. Is the broker entitled to a commission on that?

S. F. M.

Bingham, Utah, August 19, 1906.

We are advised by an authority on the law that: Assuming that the contract in question was a mere privilege given to the so-called broker by the owner of the property within a given time upon specified terms, and not a contract of employment authorizing the broker to sell as the agent of the owner, no obligation rests upon the owner to compensate the party holding the option, for a sale made after the option lapsed, although the purchaser's attention had been originally called to the property by the holder of the option. The measure of the so-called broker's rights is found in this contract or option. As to everything done outside of his contract he was a mere volunteer and cannot claim compensation.

The facts stated do not establish any implied contract on the part of the owner to compensate the holder of the option. Certainly there was no express contract to pay any commission.

To entitle a broker to recover commissions for sale of property he must show employment to sell. The relation of *principal* and *agent* must be established. This relation is fiduciary in its nature. The facts recited clearly show the relationship to have been that of vendor and vendee, where the parties were dealing at arm's length. The option was simply a contract by which the owner of the property agreed that the person who calls himself a 'broker' should have the right to buy at a fixed price within a certain time. He was not a *broker* as to this transaction. He was a 'promoter' or 'option holder' simply. It is quite clear under the facts stated that the so-called 'broker' has no right of action against the owner of the property.—Editor.

As to Foremen.

The Editor:

Sir—This perfect foreman, discussed in your recent issues, often has very difficult problems to solve and it occurs to me that those who know his qualifications would probably be willing to supply a bit of urgently needed advice. Suppose the foreman is unfortunate in choosing his superintendent and finds that the latter has no thorough knowledge of mine-timbering, but thinks he has. Should the foreman insist upon doing his work right and get his time, or should he do as the superintendent thinks right? Which course would prove him perfect?

Suppose the superintendent has a drunken brother in the mine, should this high-minded foreman keep said brother at the expense of the company, or should he discharge him, at any cost?

We perfect foremen should form a union and compel all superintendents to pass an examination as to their fitness to employ us. It would save us from many such quandaries.

A PERFECT ONE.

Goldfield, Nevada, August 17, 1906.

Mining in Northern California.

The Editor:

Sir—Mining in the northern part of the State offers many advantages to the investor. It is true that many of the veins are low grade, in fact the ore itself is not so valuable as the tailing from mills in other localities, but this is offset by advantages not possessed in other parts. Wood and water are plentiful, and labor is reasonable and of good quality.

The following figures of an actual test under my supervision will give an idea of the possibilities. This test is a six months' run of about 3,000 tons of ore mined by hand labor and crushed in two 2-stamp batteries with concentrators, all run by water-power, and includes all costs—mining, milling, development, etc.; 330 ft. of raises were put up in ore, 150 ft. of drifts in ore, and 300 ft. of drifts in granite. The development alone, which is included in the cost per ton, would probably amount to about $1 per ton, but this I consider as much the cost of mining as the actual stoping. The vein varied from two to nine feet and would average about four feet. The mill crushed an average of 18 tons per day through a 24-mesh screen for the sulphide ore and through a 30-mesh screen for oxidized ore. The saving with the former ore was satisfactory, considering no means were employed for saving slimed sulphides, while with the oxidized ore the two-stamp mills were most unsatisfactory. Neither stems nor cams were broken and the guides hardly showed signs of wear, although each stamp had dropped over thirty-three million times.

		Cost Per ton.	
Mining	Labor	$1.70	
	Explosives	0.18	
	Candles	0.06	
	Timbers	0.13	
	Supplies	0.01	
			$2.08
Milling	Labor	0.36	
	Supplies	0.15	
	Powder	0.14	
			0.65
Superintendence and office			0.32
Total			$3.05

ALGERNON DEL MAR.

Enterprise, Cal., August 18, 1906.

The White Mountains.

The Editor:

Sir—Standing on the peak of Mt. Whitney, you may look eastward over two parallel mountain ranges into Death Valley. Mt. Whitney, the crest of the great Sierra Nevada, has an altitude of 14,502 ft. above sea-level and is the highest point in the United States. Death Valley, 400 ft. below sea-level, is the lowest area of dry land in the United States. Both are in Inyo county, California.

Standing on Whitney's peak a strip of emerald lies 10,000 ft. below you. It follows the eastern base of the Sierras for about 100 miles. It is Owens Valley. Rising abruptly beyond this strip of green is the White Mountain range. This range is approximately 100 miles long and parallels the Sierras on the east. It rises sharply out of the great desert basin from a base altitude of about 4,000 ft. to an average of 8,000 ft; the highest point, White Mountain peak, reaches 11,321 feet.

The north end of the White mountains rises in Esmer-

alda county, Nevada. The range continues southward through the southeast corner of Mono county and nearly the entire length of Inyo county, California, where it terminates. At the southern end lie the once famous lead-silver mines of Cerro Gordo. The products of these mines and the commerce incident thereto were the beginning of the modern city of Los Angeles, California, the nearest supply point. The mines of Cerro Gordo have a record of something over $17,000,000 in bullion produced.

Remains of ancient arastras and crude smelters used by Mexicans in the '50s and early '60s, are found at intervals in these mountains, proving that those early miners found ore sufficient to invite them to efforts for wealth, with crude methods and slow processes, in a locality barren of food-stuffs, meagre water supplies, far removed from commercial points, out of range of transportation, save by donkeys, and confronted with marauding Indians. Legends of the White mountains abound in recitals of wonderful mines, battles with Indians, suffering, privation, and toils such as are typical of frontier life. Relatively few facts are obtainable. Isolation, privations, and dangers drove away or killed the early prospectors, and the hills, long silent, are now just beginning to echo the song of the invading burro and click of the prospector's pick.

From the railroad now following the valley at its base, the range will certainly arouse the curious attention of miner and geologist. It is a most inviting locality for those who seek for gold. I have been up into what is locally known as the 'gold zone', lying on the western slope and near the base of that range, at a few points. Recent developments, at various localities, beginning at Buena Vista in Esmeralda county, Nevada, on this western slope, and as far southward as Black Canyon, about 40 miles, verify some of the legendary tales of properties that can be made profitable. Gratifying success is rewarding modern systems of development, and these White mountains ought to be exploited by men who know how.

FRANK DRAKE.

Bishop, Cal., August 12, 1906.

Who Is a Mining Engineer?

The Editor:

Sir—To me it seems you have raised a rather delicate question—delicate, because of the disposition on the part of some of the profession to form a sort of exclusive set, the members of which hold themselves aloof from others who are their peers in every respect. I am not giving consideration to those imposters who, having memorized a few technical words and phrases from text-books, write what they call 'reports' on mines, and sign 'mining engineer' after their names.

That those constituting the 'smart set' among mining engineers have any reason to consider themselves superior in any way to the balance of the profession is not in every case apparent to the careful observer, for there are among them some of the most notorious pretenders—men who have achieved no success, earned no honor, or in any manner accomplished anything that would, in the minds of competent judges, stamp them as being entitled to more than ordinary consideration. There is a certain class of engineers who look with disdain upon all others of the profession not in their set, regardless of their qualifications or actual accomplishments—they are outside the sacred circle, and consequently tabooed. The mention of the name of one of these is met with a cynical smile or the contemptuous shrug, on the part of the elect. But are these, the '400' of the profession, the most competent to judge "who is a mining engineer?"

When a man graduates from a mining college and receives the degree of E. M. or M. E., as the case may be, he is certainly entitled to be recognized as a mining engineer, even though he be neither eminently successful nor prominent in the profession. This may be due in part to his lack of better opportunities. There are young men of my acquaintance who have graduated with high honors; they are successful, in a way, but not noted. In college they were not prominent in fraternities, giving more attention to their studies than to the social life of the college town—so, in the after days, they are not noted as mining engineers. I know other young men who were in the same classes with the first mentioned. They were foremost in fraternity life, but passed their ex's by the 'skin of their teeth,' with the aid of much coaching, and these young men, almost without exception, hold positions of trust, honor—and big salary. There are exceptions, however, to both of these. Not infrequently young engineers attract attention to themselves early after graduation by writing of their work, and they are called to take responsible positions with commensurate salary attachment.

But what of the non-graduate engineer? There are men who stand high in the profession, men who have forced their way upward from the ranks, and who are now prominent because of their practical knowledge and large experience. They know what the college man knows, but know it more thoroughly—as the college man will know it later on, when he has had the practical experience. The object of the college training is to lay a foundation for the experience of the future. The student simply goes to the point by a less circuitous route. Science is organized knowledge. The experience of generations in the past has been carefully collated, the best has been adopted and this is taught in the colleges, so that in the four years of the college course the student has the principles of his profession drilled into him. His practical experience during the college years is limited to a few weeks each summer in actual mining or metallurgical work, but after graduation he advances rapidly.

The mining engineer, to be competent, must have large experience in many things. He must understand geology, particularly that branch of the science dealing with ore deposits and their genesis. He must have had experience in the drilling and blasting of rocks; in transportation; and with the various kinds of power—water, steam, gas engines and electricity. He must have knowledge of metallurgy and of engineering, and the problem of handling men is not the least of those requiring his careful consideration. Above all these he must possess, in an eminent degree, good judgment—more often called common sense. In my opinion the man having these qualifications is entitled to be considered a mining engineer, whether he has had the advantage of academic training or has acquired them in the hard school of practical experience, though none will doubt that where the two are found combined the best results may usually be found.

AN ENGINEER.

Los Angeles, August 21, 1906.

UP TO velocities of air-current of 400 ft. per minute the speed of the current may be measured n a drift of uniform area as follows: The operator walks along the drift at a uniform rate, and for a measured distance, carrying a candle at such a speed that the flame shall burn in an upright position without being deflected from the vertical, either by the current or by the progress of the person carrying it. The time in seconds to traverse the known distance is determined by a watch, and the average of several trials used. Let us take, for example, the distance as 300 ft., the time as 70 seconds, and the dimensions of the gallery 5½ ft. high by 6 ft. wide. We then have $\frac{60}{70} \times 300 \times 5\frac{1}{2} \times 6 = 8{,}485$ cu. ft. per minute.

Breckenridge, Colorado.

Written for the MINING AND SCIENTIFIC PRESS
By JAMES W. NEILL.

Breckenridge lies in the valley of the Blue river, some forty odd miles from Leadville, on the line of the South Park railway, and the trip thither is one to be remembered for its scenery. The little train winds around the cliffs, climbs the Fremont pass and fairly rattles down the steep grades past Kokomo, Robinson and Dillon; then up the little valley to Breckenridge. There are mines all along the route, some past, some present, and some future, as is evident from the surface works, dumps, old metallurgical plants and the like; all these only add details to the interest of the trip, and the main thought as one flies down that canyon is, "I wonder how big the trout are in that hole?"

Breckenridge has long been the centre of placer mining activity, and it was to see some of this that my visit was made. Of principal interest to me was the work being done close to town by the Gold Pan Company; this is an 'elevator plant,' that is, the gravel is moved from the pit by means of hydraulic elevators; a jet of water from a large nozzle is directed into the bottom of a pipe of large diameter, and by the energy of this stream of water large stones, and much additional water, are raised to the necessary height. The accompanying photographs show this plant in some detail. The first one shows the pit which is the mine. This pit is sunk to bedrock, in this case about 60 ft.; to say this is easy, but to do it is a hard task! This work is being done in the bed of the Blue river, which had first to be turned aside and carried past the locality in a big flume, on high trestles, in places over the edge of the pit. Then the bedrock water or natural seepage has to be pumped and the material handled, the sides supported, the boulders taken care of; and all this without the aid of the elevators, for these cannot be installed till the pit is made.

The stand-pipes of the elevator system, which is in duplicate, are seen on the left of the upper print; the lift-pipes are 12 in. diam. and the water-pipes about 10 in. The main supply-pipe is seen on the top of the bank just to the right of the elevators; this brings the water from several miles up the canyon under a head of several hundred feet, and gives not only the elevator water but also the pressure for the monitors that break down the gravel. One of these is seen in the foreground playing on the bank, and the force can be realized from the fact that the nozzle is six inches in diameter, and throws the stream 200 ft. to the top of the 60-ft. bank. The photograph was taken at noon, hence no men are seen, and the nozzle is quiet.



Hydraulicking and Elevating.

From being simply a funnel-shaped pit with the elevators at the centre, the operation is extended by the giants as they wash the gravel down into the bedrock flume which leads to the foot of the elevator pipes; this ditch is seen in the photograph directly behind the giant, and looks something like a pipe leading to it. Down this flume the smaller gravel and rock is washed and raised by the water into the sluices above, where it gives up its precious values to the riffles and quicksilver; the water falls through a screen or grizzly, and the rock is dumped onto the foot of a traveling belt, and this carries it up and finally dumps it at a considerable distance and height from the pit.



Disposal of Tailing by Conveyor-Belt.

The apparatus just described is shown in the second photograph, which, on the left, shows the outer end of the sluices, then the dump where the water is wasted, and the sand goes away down stream, then the steep incline of the first rubber belt, and this in turn dumps onto the final rubber-belt carrier which takes the rock to the dump. This material is naturally only of a size that will pass through the pipes, everything larger than this has to be handled from the pit by means of traveling locomotive-cranes, seen in the first photograph on each side of the cut. These cranes handle the rock on boats,

onto which it is loaded by hand, and it is necessary for a man to go to the dump each time to unhook one chain, so that it will dump. What with four men to load boats, one to run the locomotive, and the time used to dump and return, etc., this seemed to me to be an expensive method of handling rock. The right foreground of the first photograph shows the size of some of the boulders, and the necessity for some powerful agent to remove them. Naturally, while the pit was being sunk, and the first start made on the opening, there was no place below for the storage of the big rock, and this was at that time taken out by means of a ropeway of the Lidgerwood type and dumped on the other side of the creek, not shown in the photograph at all. It seemed to me that some mechanical scoop or bucket operated by cables could be used here in place of the many men, and these only help to hook on the largest rock.

The bedrock seemed very flat, and as the flume or sluice has to keep on it, this too was at a grade on which even the large amount of water did not move the larger cobbles, so that one or, at times, two men were constantly moving up and down this sluice, helping the cobbles along with shovel—which also seems an expensive operation.

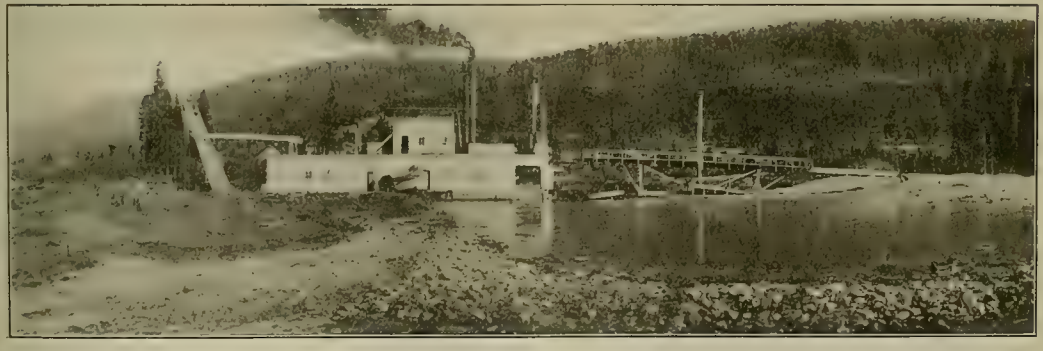
I could not readily make even a guess as to the yardage handled, and the operations were in fact not on a regular basis, as the flume which carries the creek around the pit had broken a short time before, filling the pit with water and gravel, and they were only just getting down to regular work again. The capacity of the elevator to handle water can be judged from the fact that when the flume was repaired, and the elevators started to pump out the pit, which was full and running over, it took just four hours to finish and get to the bottom.

The plant is equipped with tremendous machine shops, but of all apparent proportion to the needs of the operations either present or future. The ground is claimed to be very rich, and from the outlay which has been made and the evident cost of the operation, I should say that it must be, to yield a profit. I do not know how else such a deposit as this can be worked; dredging is out of the question, the size of the boulders precludes this, and even drift-mining would probably be impossible owing to the large amount of bedrock water, and to the nature of the gravel; so that this method, improved by better mechanical and executive methods, would appear to be "the only way."

The "other way" is illustrated in the next two photographs, one showing the operation of a Keystone drill, prospecting for gold or rather testing the gravel of a known placer. The mill-men are just dumping the sand-pump, the contents of which are being caught in a pan by the chief, whilst a visitor makes notes on the side, and the panner washes the material obtained in the previous pumping. The rocker, in the middle foreground, is used to clean up all the material taken from the drill-hole, and the tailing from this rocker falls into a box, and is thus measured, so as to make comparison with the theoretical contents of the drill-hole. The nature of the material is indicated by the pile of rock on the right, taken from an old elevator-pit or incline sunk years ago. This is in the valley of the Swan, and in the distance is seen the tailing dump of a dredge-boat.



Prospecting for Gold-Bearing Gravel With a Keystone Drill.



Dredging for Gold at Breckenridge.

The last photograph is of a dredge (the Reliance) working on one of the tributaries of the Blue, about three miles from Breckenridge. It is a steam-driven sluicing boat, having 8 cu. ft. buckets open-connected, and though digging in hard ground and bringing up many good-sized boulders, it is evidently doing good work and plenty of it. The gold in this district is coarse, much of it in wires and small nuggets, and the sluices save this, or nearly all of it in the first few riffles, the undercurrents on the tail-barge yielding very little.

A Note on the Rhodesian Gold-Mining Law.

Written for the MINING AND SCIENTIFIC PRESS
By THEO. F. VAN WAGENEN.

The following story is told of an Australian miner who came to Rhodesia last year to try his luck. He was a good man of his class, and landed at Beira with a few odd pounds and shillings in his pocket, and at once took the train for the hills. When Umtali was reached, and he found himself, to his delight, once more under the shadow of the Union Jack, the appearance of the country so pleased him that he got off the train and, after a day in town, he bought himself a pick and shovel and pan, loaded them, together with some *scoff*, or 'grub,' on a donkey, and started off on a prospecting tour. In a couple of weeks or so he came back, and inquired his way to one of the banks. Arrived there, he drew from his pocket a buckskin bag, and passed it over to the teller with the request that the gold be weighed, and its value in sovereigns be given in exchange. When the contents of the little sack were poured on the scales, there were about twenty ounces of very nice-looking alluvial gold in the pile.

"Prime-looking stuff," said the teller. "What is the number of your claim?"

"Oh, I have no claim yet," replied the Australian. "I just washed that out while prospecting."

"We must have a claim number to declare it by," said the teller, with a rather suspicious look in his face.

"Why," said the miner, "it's nobody's business but my own. Do you think I stole it?" he added, while a little red spot showed on each cheek.

"Oh, no," returned the teller, suavely, but edging off a little; "that's all right, but we must report to the Government where it came from, or we will get into trouble."

"What's the Government got to do with the matter, anyway?" returned the Australian—"I found the place and dug the gold out. It took a week of hard work too, and I had a touch of this damned fever I hear of. There is more of the stuff, I guess. If there is a royalty, take it out. And take out your charges, too. I'm willing to pay for coin, and I'll paint this sleepy town of yours a bright crimson before morning. But I'll see the Government in Hades with its back broke before I'll tell where I got it. Why, half the loafers in town would follow me out there and jump the ground before I could peg it. Does the Government think I'm a fool?"

"Sorry," said the teller, "but we can't buy it. Against the law. Nice gold, too. Just what the country wants to put some life into it." And he passed the little yellow pile back to the miner. "Better go and see the mining commissioner," he added, "he will fix you up."

"Yes, and maybe he'll attach all the gold, and chuck me in the cooler besides," said the Australian, disgustedly.

"Oh, no," returned the banker, "he will treat you all right. Better go and see him."

"Maybe," said the miner, as he gathered the bags into his pocket and turned to the door. He was hungry, very much in need of some new togs after his long tramp, and out in the street were a dozen or so of black 'boys' waiting for their pay. The situation was complicated, and not at all pleasant.

Across the road was a general store, to which he went, and, having laid his pile of nuggets on the counter, he asked to have them weighed, so he could buy some clothes, adding that he "would take the balance in coin and notes."

"We don't buy gold," said the proprietor, "and I wouldn't know how to figure it up anyway. But the bank will buy it of you. Nice gold! Where did you get it?"

"I don't see that that's anybody's business but my own," retorted the miner. "I haven't asked you where you got these goods you want to sell me, or whether you paid for them. What kind of a hell of a country is this anyway? Don't you want to get rid of your merchandise? Why don't you get a little pair of scales, and learn how to buy gold? There's money in it, and you're dead safe, and you'll sell your stuff besides."

"Couldn't possibly afford it," said the shopkeeper. "A license costs £20, and there wouldn't be two customers of your kind in a twelve months. Why, man, I've been here for nine years and this is the first time I've seen any real gold. I never thought you got it that way. Always supposed it came out of a stamp-mill, and in little white balls about the size of an apple."

"The suff'ring Moses!" ejaculated the Australian. "I supposed this was a mining country—and it *is* one, only you people don't know it. Say, will you take the gold over to the bank and sell it for me?"

"Certainly," said the other, "but you will have to come along and sign the declaration. What's the number of your registration certificate?"

"Certificate be hanged," said the miner. "Haven't got any yet. I've only been out prospecting. Maybe the ground ain't worth pegging. It took me a week to wash out this, and I want to prospect up and down the gulch a bit before I locate. What's the use of taking up the worst patch when the best one hasn't yet been found? Do the miners of this country peg out ground before they have tested it?"

"Well," said the friendly shopkeeper, "to tell the truth, I don't know how they do it, and more, I don't believe there's a real prospector in the country. I've never seen one, or heard of one. There's lots of engineers and managers and secretaries, and other such cattle, but they don't seem to know much about mining, judging by the way things come out at most of the mines. But say, if you haven't got a claim you had better get one, or else go and put that gold back where you got it, or get it off your hands some way, or it will get you into trouble."

"What's the matter with *you* taking it?" said the Australian. "It's gold all right. You take it and give me a suit of clothes and a pair of shoes, and enough coin to pay these niggers outside, and some cash to go on. I'll be liberal. There's more where that came from. Don't you want to do business? I haven't stolen it. There's money for you in the deal, and you can work it off. You know the ropes."

"I daren't," replied the merchant. "It would get me into all kinds of difficulty. No, I think you are all right, and I'd like to sell you what you want, but it's too risky. Say, you go up to the mining commissioner. He'll fix you all right some way. First-rate chap." And, going to the door, he pointed the way.

"I suppose I'll have to," said the miner; "but I never struck just this kind of a lay-out before. Why, it's worse than the way they do things in Siberia."

Up the almost silent street he went in the direction indicated, and, having found the Mines Office, he stated to the clerk that he had some gold and wanted to declare it, and transform it into money. And he poured out the glittering grains on the counter.

"We don't buy it here," said the clerk, "but all you have to do is to fill out this blank and swear to it, and the bank will take it off your hands. Nice little pile of stuff," he added, and, stepping to the door, he called the attention of his chief to the matter. The latter came out of his office and looked over the pile interestedly. Meantime, the Australian had been studying the blank to see what he had to swear to. "Where did it come from?" said the commissioner, finally.

"About 60 miles out to the northwest," responded the miner. "But say, Mr. Commissioner," he added, "I can't fill out and swear to this. I've got no claim pegged out. I've just been prospecting. I've got some promising ground, but not good enough to peg out yet. So I want to sell this, and pay my boys, and get some clothes and a new jag of *skoff*, and go back and do some more work."

"Haven't you pegged off your ground yet?"

"No, of course not. I'm only prospecting so far. There's only a little patch where I got this, but I guess there's plenty more near by. But I don't want to peg where I've been working. I want to find the main body, and get enough good ground to make it worth while. There's no sense in taking up a little streak off the main channel. I want to get enough to make a mine. You see, some of the bars along the gulch are no good, and some are patchy, and I'm after a full claim."

"H'm," said the commissioner, "I see. That's good common sense. We must fix you up someway. Here," to one of the clerks, "make out a discovery and registration notice. Now, my friend, here's the way you do it. You put up the discovery notice—no, you first put up a peg where you got the gold; then, say 20 ft. away, you put up another, and put the discovery notice on it, and make a copy of it. Then you wait a few hours, or a day if convenient, and then put up the registration notice, and make a copy of that, and mind you be careful about putting the date and hour of the day on both. Then you put up your claim pegs, four of them. Then come in here and bring your copies, and we'll fix up your papers. You'll have to swear to the copies and make a little sketch plan of the block and the country around it, so we can tell where your ground is, and then an affidavit that you are going to work the ground for gold, and then you pay in a five-shilling stamp, and we give you a registration certificate, and you go out there and put the number of it on beacons on your corner pegs. Then, when you come back, you can fill out this gold-declaration properly and swear to it. You've been working a little irregular, you know, but that's all right. You must have some ground before you can sell your gold, so we may know where the stuff comes from. And, oh, by the way, I forgot, you'll have to turn in your license and give it up when you register, but you can buy another one. They only cost a pound."

"What's the number of the license?" said the clerk, who was filling out the papers.

"Haven't got any license," growled the prospector. "Do you take me for a millionaire?"

"The devil!" said the mining commissioner: "That's bad. You must have a license to prospect." To the clerk—"Make out a license for him. Cost you 20 shillings, my friend—and lucky to get off at that, for you've been breaking the law, but that's all right. You didn't understand the rules, and I wish we had a lot more of you Australians out here."

"Hold on," said the prospector to the clerk, "hold on! You're going a little too swift for me. I've got no quid* for that license. Look at those boots, will you? I've tramped 200 miles in them already. Now you say I've got to go out to the ground and put up my pegs and notices, and then come in and get a number, and go out again and put that number on the beacons, and then come in and sign all these papers, and put up five shillings more. That's 240 miles more of walking, and a month's work, and then I can sell the gold, and then you'll take the prospecting license out of it, eh?"

"Well," said the official, "that isn't quite regular, but you leave the gold here and we'll take the chances on you. And, oh, I forgot—you'll have to pay a pound a month claim license besides, and you'd better just leave about three months' license money with us before you go, so as to be safe, and if you think you are likely to want to peg out any more ground, you had better take out a half-dozen licenses; they will always come in handy."

The Australian was rubbing his chin and thinking. "Say, Mr. Commissioner," he said finally, "you're a square man and a good friend, and this is God's own country surely, and I'm a bloody law-breaker and ought to be in chains. Now I want to show you I am grateful. That's a neat little pile of gold, eh? About twenty ounces in it. Ought to be worth about seventy quid. It's 200 miles to Beira, isn't it? Yes. And I owe those niggers out there just £8.15. And third-class fare from Beira to Melbourne is £14. I'll have to take to the boat, as the swim is a little too long. Now, *you* take that gold and pay the boys, and give me twenty quid. And *you* go out and peg that ground. It's awful rich—gold just everywhere. I'll hit the trail for Beira. It will be a saving of 40 miles in the walk. . *You* take the ground, and pay the licenses, and the 5s.-stamp, and the claim-license, and be happy. Take my blessing. The altitude's too high here to suit my health. It gives me a pain. You make a clean 30 quid on the deal and get the ground besides. Ain't that fair?"

When last seen the Australian was climbing into a train at the station, that was headed eastward. He had a new suit of clothes on, and looked happy. How it was accomplished no one will ever know. But there was a young fellow at the platform, bidding him good-bye, who had just handed him a ticket to Melbourne, and a dozen yellow boys with King Edward's face upon them, good the world over for anything that money will buy; and as the train slowly moved away, the tall Australian wrung the youngster's hand and said:

"Say, kid, the chief's all right. He got me out of a bad corner and I'm grateful. If anyone from the office ever shows up in my camp, you bet he'll be treated white. But say, you tell the old man that if he ever hears of a prospector coming this way again, he ought to tell the mayor to call out the brass band and all the sporting clubs and secret societies, and meet him at the station, and present him with the freedom of the country, for it will pay big. Good-bye."

*Colloquial English for £1.

COLOMBIA is rich in minerals, says a consular report. There is an immense coal supply in Colombia. It is found in many different parts of the Republic, including the neighborhood of Cali in the Cauca and near the Atlantic coast. There is much soft or bituminous coal in the mountains around Bogota. Gold is mined in the States of Antioquia, Tolima and Santander in paying quantities. Silver is found in Antioquia, Cauca and Tolima; copper in Boyaca, Antioquia, Cauca and Tolima; emeralds in Boyaca; platinum in Choco; petroleum in Tolima; while lime, chalk, marble, asphalt, lead and quicksilver are found in many parts of the country.

PLATINUM has been found in the copper ores of the Rambler mine, near Encampment, in Wyoming. It occurs there in the form of sperrylite, the arsenide of platinum, and is associated with covellite, the monosulphide of copper. Chromite is another mineral which is likely to carry platinum in association. The platinum of the placer mines of northern California is always accompanied by osmium, a rare metal for which a use has lately been found in the manufacture of the Auer incandescent light. This will render the platinum mining industry more profitable.

SCIENCE is nothing but trained and organized common sense.

Cyanide Practice With the Moore Filter.---II.

Written for the MINING AND SCIENTIFIC PRESS
By R. GILMAN BROWN.

So little has been published concerning the Moore process that no excuse is needed for explaining it, with as much minuteness as is possible in the absence of notes and working drawings.

The points in common between the Moore and the Cassell-Butters process are: The filtration by vacuum, with the resulting adhesion of the cake to the outside of the filter; and the general type of filter, which allows of great area in compact and cheap form. It seems to me that the point of adhesion of slime to the filter, making possible its removal from the remaining pulp, is the real point of difference between these and other slime methods. Others in plenty have filtered by suction, others have used parallel closely spaced units to secure maximum area in minimum volume, but so far as I know the adhesion of a cake to the outside of a filter and its removal by this means from the unfiltered pulp is the essential novelty with which the Moore process should justly be credited, in practice, at least. The essential difference between the Moore and the Cassell-Butters method may be considered an inversion of the Mountain-Mahomet theorem; Moore transfers the filters, with their load of slime, by means of a traveling crane from the pulp to the wash-water tank and then to the discharge hopper, while the Cassell-Butters plan removes the pulp from the filters by pumps of large volume, substitutes wash-water and then discharges, the operation being conducted in the same vat.

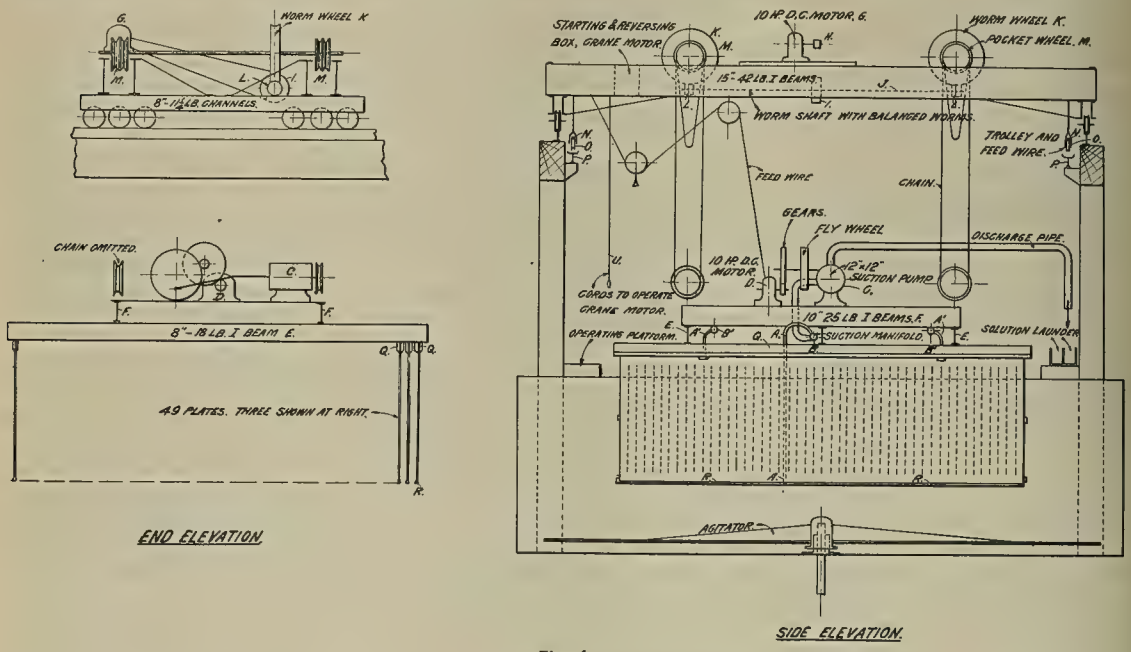


Fig. 1.

Others have filtered by suction, others have used parallel closely spaced units to secure maximum area in minimum volume, but so far as I know the adhesion of a cake to the outside of a filter and its removal by this means from the unfiltered pulp is the essential novelty with which the Moore process should justly be credited, in practice, at least. The essential difference between the Moore and the Cassell-Butters method may be considered an inversion of the Mountain-Mahomet theorem; Moore transfers the filters, with their load of slime, by means of a traveling crane from the pulp to the wash-water tank and then to the discharge hopper, while the Cassell-Butters plan removes the pulp from the filters by pumps of large volume, substitutes wash-water and then discharges, the operation being conducted in the same vat.

In the Standard Co.'s plant the filters are of canvas of medium weight, 5 ft. wide and 16 ft. long; the canvas is double, sewed round three edges, and the fourth (long) edge is bolted between slips of Oregon fir (*Q Q*, Fig. 1) 1½ by 6 in. in cross-section. In the bottom edge of each filter or 'plate' is a ¾-in. channel-iron (*R R*) that serves as a launder for the in-filtered solution. The filters are stitched through both sides vertically at four-inch distances and in the compartments thus formed ¼ by 1 in. strips are inserted to allow circulation. Within each filter a 1-in. vertical suction-pipe, flattened at the end so as to dip into the channel-iron launder, reaches to the bottom from the outside. The outer end of this is connected by a short length of suction-hose to a three-inch manifold, through which the suction is applied. The details of this will be better understood by reference to Fig. 1: *A* is one of the vertical suction-pipes, *B* the manifold in end-view and A^1 and B^1 the plenum-pipes and manifolds. In the Standard Co.'s plant there are 49 of these 'plates' hung from a frame of steel I-beams (*EEE*, *FFF*), the distance between centres being four inches. This constitutes the 'basket,' approximately 16 ft. square. On the top of this rests a suction-pump (*C*) 12 by 12 in. driven by a 10-h.p. D. C. motor (*D*), which derives its current from the crane overhead. With a vacuum of 20 in. the motor consumes 3 h.p. of current, but in the early part of the cycle when filtering is fast, there is a heavy rise in power at the end of the stroke due to expelling solution from the slender clearance space. To equalize this the pumps have heavy fly-wheels. Clearly this basket arrangement lends itself to great area of filtering surface, there being 7,840 sq. ft. concentrated in each unit. The basket is hung by four endless one-inch pitch-chains to the overhead crane and is raised or lowered by a 10-h.p. motor (*G*) through the medium of balanced worm gearing and differential chain-wheels. The driving pulley on the motor is indicated at *H* and the driven pulley at *I*, on the worm shaft *J*; *K K* are the worm-wheels, keyed on the shafts of the pocket-wheels *M M*. These

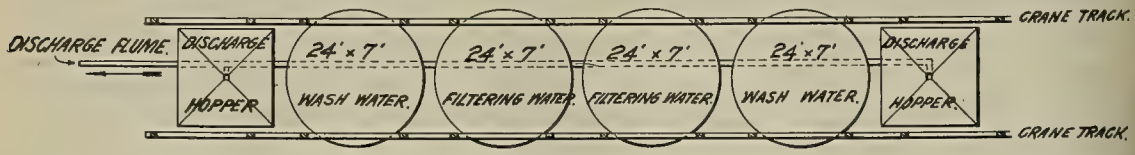
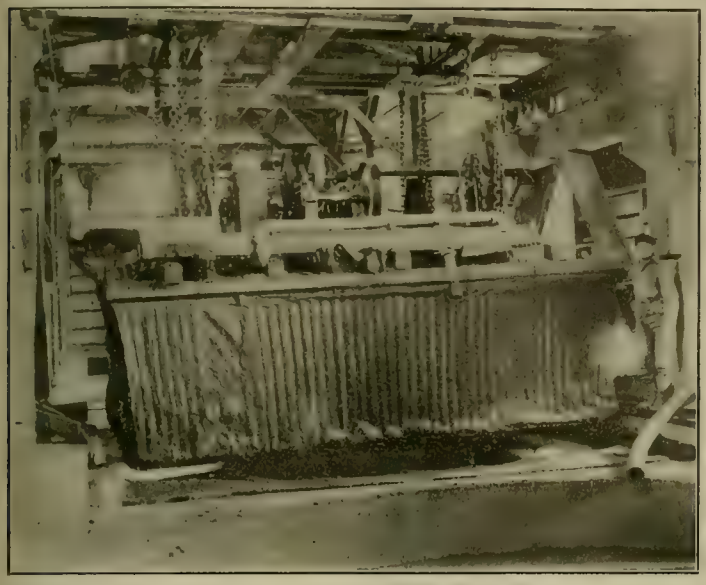


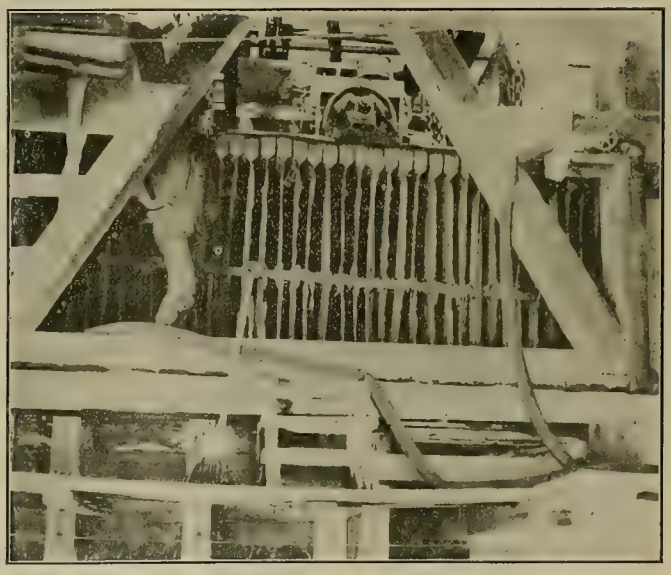
Fig. 2.

worm-gears are right and left thread. The worms bear on collars on the ends of the worm-shaft and the direction of rotation is such that, raising the load, puts shaft *J* in tension; at the same time the worms being right and left, there is practically no end-thrust on the bearings. The pocket-wheels are of six and seven pockets respectively. The crane-motor and pump-motor get current from the trolley-wires *N N* through the forks and wheels *O O*; *P* is the insulated rest onto which the trolley-wire drops, when not held up by the wheel *O*. The crane-motor is operated through the starting-box *T*, which is controlled from the tank-floor by the cords *U*. The total maximum load of the full basket on the crane is 35 tons and this is raised about seven feet in five minutes. This represents about 3 h.p. The motor consumes 8.4 h.p. of current, so that the loss, even with the balancing of the worms, is heavy. Still, as the hoist is in operation not above one hour per day, this is negligible. Notwithstanding the differential gearing was furnished by specialists, it gave trouble at first, largely because the pockets in the wheels were not deep enough or well fitted to the chain. Even now when this has been overcome, guide-wheels that were devised to make the chain grip the pockets better are retained as a measure of precaution. Probably any future design should have wheels with twice the number of pockets. The general construction of the crane is clearly indicated by Fig. 1 and the photographs, and needs no explanation. The pocket-wheels are placed at quarter-span points of the large I-beams, and all stress calculations were for a factor of safety of five. The supporting track is of 60-lb. T-rail and rests on heavy 12 by 18 in. longitudinal sills, the caps of the supporting sets. To prevent spreading of track, the sets are framed back to the main posts of the building. All of this construction could well be of structural steel where transportation cost is not prohibitive. The traversing device for the crane is a $\frac{5}{8}$-in. plough-steel wire-cable, run over three and four-grooved sheaves, after the manner of the Koepe hoist, the main sheave being driven by a worm-gear from the main-line shaft. A grip on the crane engages the cable and the gear is started, stopped and reversed by a belt shifter through the medium of levers conveniently placed for operation by the basket-man. The tail-sheave is on a carriage and adjustable to take up stretch of the cable. The rate of travel is five feet per minute. Fig. 2 shows the general plan of the filtering-vats and the discharge-hoppers. The filtering-vats (which, along with the others, belonged to the former sand-plant) are round, flat-bottomed vats 24 ft. diam. by 7 ft. deep. They have four-armed agitators (Fig. 1) running at 7 r. p. m. close to the bottom. The shaft to which these are attached is driven by crown-gearing below the tank. A special stuffing-box devised to keep the sand out of the bearing has proved satisfactory, but could be improved upon. In addition to the agitators, each filtering vat is fitted with two six-inch air-lifts discharging onto two distributing launders on the tops of the baskets. These are run intermittently during the accretion period and serve to bring the coarser particles to the surface, whence, as they slowly settle, they are caught by the suction currents and deposited on the filter with the slime.



Moore Filter, With Cake.

The action of the filtering process is as follows: The basket is lowered into the vat full of pulp, until the tops of the slats are submerged, and the suction pump is started. The first solution coming through muddy is turned back into the vat. It soon clears, however, unless a filter leaks. Should there be a leak, the identity of the faulty filter is quickly established by an inspection of the glass nipples connecting each individual 'plate' with the manifold, and that plate is cut out by closing the proper service cocks in the manifolds. Suction is continued with intermittent agitation until a sufficient coat is obtained, which in this case averages $\frac{3}{4}$ in.; then the basket is raised, the suction-pump still running, and



End View of Moore Filter-Basket.

traversed, with its load of slime adhering, over the wash-water tank and lowered therein. Here suction is continued with frequent titration of the filtrate toward the end, till the solution has fallen to the predetermined minimum net strength of cyanide. The displacement is good, about 0.7 ton wash-water being needed per ton of dry slime; the cake in this condition carries about 40% moisture, so that every ton of slime is accompanied by 0.67 ton solution. The limiting net cyanide content of the filtrate is the difference between that in the wash-water, which always contains a little that has been soaked off from previous charges, and that of the filtrate. This is in the neighborhood of 0.15 lb. per ton or 0.0075 per cent.

After washing, the basket is raised again and run over the discharge-hopper; the suction is continued till excess moisture is removed and then an air-pressure of 35 lb. is turned on, in successive blasts of a few seconds each. This causes the cakes of slime to drop off, the discharge averaging about 85% of completeness. Every alternate day the filters are cleansed by substituting water, under 20-lb. pressure, for air. On each basket there are two special air-manifolds connecting with the inside of each filter, at points four feet from the ends. Probably these could be omitted, and the vacuum manifold be used for the plenum as well. The discharged sludge averages 68% *solids* and is sluiced from the hoppers into the waste-flume, about a ton of water being used for each ton of slime. The grade of flume for this class of material is 9/16 in. per ft. The time consumed in a single cycle depends primarily upon the thickness of the pulp; as an instance, a pulp of 20% solids will scarcely build up a one-half inch coating in 10 hr., while pulp of 40% solids will give an inch coating in two to three hours. The average thickness for last year was 0.74 in. and the maximum for any one month 1.14 in. The time of the accretion period is about three and one-half hours; washing and discharging take the same, making about three full cycles in 24 hr. with time for emergency matters. This is considerably longer than is the experience elsewhere and must be attributed to the large proportion of clay in the material. During one month, when clay was notably less, the average fell to 2.35 hr. for accretion and 2.9 hr. for washing and discharge. The average load handled in each cycle is close to 18 tons of dry slime, so that the two units in this plant have an average capacity of 108 tons per diem. This has not been obtained in practice over any extended period, but the limiting factor has not been the filtering, so that the monthly capacity of the plant has been conservatively placed at 3,000 tons per month. Fifty-eight per cent of the total solution recovered from the plant has come through the filters. Beyond this point the process is the same as in any cyanide plant except that the sump solutions, after being standardized in storage-tanks, are returned by a three-plunger pump to the mill.

Taking up some of the details not yet touched upon, the following is to be noted: The question of the wear of the filters is an important one. An extreme life of 10 months has been noted in some cases, but, if badly made or carelessly handled, they require constant attention, repairs, and renewals; half a cycle per day can easily be lost in this way. Six months can be taken as a fair average life; this, at a monthly tonnage of 1,500 per basket, makes the cost 5c. per ton. In other plants where smaller filters are used, the canvas is stretched on an internal frame of pipe and so kept taut, the pipe, at the same time, serving for suction and discharge-pressure. In the Standard plant no trouble has been experienced from letting the filters take their natural hang, and when the plant was being designed, the stretching of the canvas over a frame did not appeal to us, both because of added expense of construction and of shorter life of the canvas, which would be under greater tension when the 'plates' distend under air-pressure and become distorted. Whether the latter is a valid objection, only unbiased comparative work can tell. The individual 'plates' are spaced one from the other by light wooden rods to which their edges are attached by twine. There are four of these, spacing the ends of the 'plates' at middle and lower corners. As a certain amount of slime gets through the filter at times (when a leak develops when the basket man is not at hand), the solution passes from the pump through a launder first to a clarifying-tank from which it is decanted to the gold-tanks. An addition, recently installed as an improvement on this, is a permanent set of 'plates' in the clarifying-vat, through which the solution is drawn. This device is used elsewhere with success.

From tailing averaging about $8 per ton the average return has been 83% of the gold and silver, the gold alone being close to 90%. Higher results have been at times attained, and the indications are that the average for the present year will tend to approach these figures. The total extraction from the ore is as given herewith; the third column gives the results for a $20 ore, this being about the average for the mine:

	Per cent of product.	Per cent of crude ore.	Value.
Recovery in the mill	64	64	$10.80
Recovery in the slime plant	83	38.2	7.64
Total recovery		92.2	$18.44

Comparing this with the old method by percolation, we have the following:

Recovery in the mill	64	64	$12.80
Recovery in the cyanide plant	70	25.2	5.04
Total recovery		89.2	$17.84

This gain of 3% or 60 cents per ton is small and hardly more than enough to cover the extra cost which on the basis of work during last fall is 22c., so that it does not furnish a strong argument for fine grinding in cases where the whole product is amenable to percolation. But so far as this ore goes, and many like it, the comparison is by no means fair. Under the former method of treatment 30% of the tailing was left in the ponds, being unfit for any but slime methods. The revised comparison then would be as follows:

Old method.	Percentage of product.	Percentage of crude ore.	Value.
Recovered in the mill	64	64	$12.80
Discharged from the mill	36	36	7.20
Left in the ponds	30	10.8	2.16
Going to cyanide plant	70	25.2	5.04
Saved in cyanide plant	70	17.6	3.52
Total saving		81.6	$16.32

This shows a gain of $2.12 per ton, ignoring any difference in cost. In our work last fall this came to $0.22 increase, so that the net gain is $1.90 per ton. Roughly, the plant cost $60,000, though it could probably be duplicated for one-fourth less, so that on the basis of the tonnage of 20,000 per year the gain represents 63% return per annum on the actual cost of the plant, fully justifying the investment. In addition to this gain is the ability to treat some 40,000 tons of accumulated slime, which has thus become an asset. The above comparison is on the figures of cost actually attained; using the cost of $2, estimated for the future, the gain would be $2.37 per ton.

The following table gives the segregation of cost for the various departments:

General expense, including superintendence, watchman, assays, insurance, taxes, chemicals, supplies, etc.	$1.202
Re-grinding	0.572
Moore process	0.314
Zinc room	0.261
Total in slime-plant	$2.349
Ponds, collecting and handling, with team	0.120
Grand total	$2.469

By the disc-harrow percolation method, formerly fol-

lowed, the cost was $2.25. This figure of $2.47 is for a restricted tonnage, and careful estimate on a basis of 3,000 tons per month brings the cost down to $2. Future work should improve even on this. Mention has been made of the accumulated tailing. This material has been made available for immediate treatment by the provision of a stock-bin outside the grinding-house. It is connected on the one side with the ponds by an inclined track and a stationary hauling system and on the other with the tube-mill by a steep launder, into which the tailing is fed from the bin, mechanically. In the case of ore of this kind with qualities of very slow settling, the addition of dry material is a decided advantage to the plant, as it increases the percentage of solids and lessens the time of settling. It is probable that this outside stuff, not having participated in the violent agitation with cyanide solution accomplished in the mortars, and moreover only coming into contact with the solution that reaches the tube-mill already weakened from its original strength of two pounds by the 'cyanicides' in the ore, does not yield as highly, and so cuts down the average extraction pro rata.

To the experienced cyanide man a question naturally presents itself as to the accumulation of weak solution. The addition to the bulk of solution comes from moisture in the ore and from the wash-water, the losses from evaporation and leakage and from the discharged tailing. On the basis of the dry ton, the additions are 0.09 ton + 0.7 = 0.79, while the determinable losses are 0.47 ton. This indicates an increase that is not found in practice. But if it were, the extreme weakness of the solution would make such a gain not of first moment. Just how the difference is to be accounted for, is not clear, but it is due in part at least to the difficulty of correctly determining the moisture in the discharge.

For years the concentrate has been treated in a pan, with a lye and bluestone charge, giving results that were only satisfactory because no way had appeared of bettering them. Soon after the slime-plant had been put in operation, the experiment was tried of treating the concentrate with strong cyanide solution, and with such good results that the method completely supplanted the old. The details are as follows: The concentrate consists largely of iron oxides with a little pyrite. This is charged in one-ton lots into an ordinary five-foot silver pan, 25 lb. lime is added and enough water to bring the pulp to about 45% solids, giving the consistency of thick cream. The charge is ground for 48 hr. and then cyanide is introduced, to bring the solution up to a strength of 24 lb. per ton. Grinding is continued with the addition of lime and cyanide at intervals, the one to insure alkalinity and the other to keep up the strength to the original. After about 72 hr. it passes to the settler for 24 hr. further agitation and finally is diluted with mill solution and turned into the slime-plant flume. Toward the end of the operation, samples of the pulp are taken at intervals, washed clean of solution and assayed, as a check upon the extraction.

An interesting feature is that during the grinding with lime, an oxidizing action—a sort of wet roast—appears to take place, the pulp changing from a dirty green to a brownish red. The results of this work for some 30 tons—one half the year's product—with an assay-value of over $150 per ton, are: Extraction of gold, 96.8%; of silver, 84.1%; total, 94.9%; the cost is $7.91 per ton. The consumption of cyanide is 18 to 20 lb. per ton. An excellent comparison of the new and the old method is obtained by considering the work of the first half of the year, which was by pan amalgamation: Extraction of gold, 87.1%; of silver, 74.9%; total, 84.4%; cost, $13.38 per ton. On $150 concentrate the gain per ton amounts to $15.75 in extraction and $5.47 in cost, a total of $21.22.

To the advocate of fine grinding the results I have given may appeal with too great force. Stamping, if followed at all, must almost of necessity be in solution, and the low cyanide content demanded by more than one factor is apt to give low results as regards the silver. In an ore which, by reason of absence of coarse gold, will yield creditably to cyanide alone, amalgamation can be dispensed with and probably less solution used. But it is doubtful if even then a solution strong enough for good silver extraction could be used without excessive loss. Certainly, however, in ore of the Standard type fine grinding gives higher results for the same cyanide strength, and the same extraction for a lower strength. Between the two there is intermediate strength that gives the maximum commercial result, and in all tests with fine grinding the aim must be to determine this point. As a comparison between the general Moore-Cassel-Butters method and filter pressing, it seems that the former has great inherent advantages in cheapness of installation and operation, and growing familiarity with the details should make this increasingly evident. In comparison with decantation, apart from the fact that for some ore decantation is entirely unsuited, it does away with the enormous bulk of solutions, from the repeated washings. In fine, it is believed that once metallurgists become better informed on the principles of the system, it will be found worthy of more consideration than heretofore.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The ore from Miramar, Cal., marked W.L.B., is lead-carbonate in a granular silicious rock.

The white rock from Gibbonsville, Idaho, marked J.W.O., is not Feldspar but Baryta (barium-sulphate).

The minerals from Paisley, Ore., marked G.G., are: The white, Kaolinized feldspar; the black, manganese oxide.

The rock specimen from Goldfield, Nev., marked L, is a much altered rock, seemingly originally granitic. The bright, metallic scaly mineral is Specular-iron (hematite).

The rock samples from New Pine Creek, Ore., marked W.E.M., are determined as follows: The hard pink colored rock is felsite, the color being due to iron oxide. It may carry gold, in which case there is probably auriferous pyrite in the rock, though none is observed in the sample sent. The soft white mineral is Kaolin, which on moistening with water becomes plastic like putty. It may also carry gold or silver.

The rocks from O'Neals, Madera county, Cal., marked M.C., are various phases of a much altered granitic rock. The white mineral is Kaolin with much secondary mica (sericite). The firmer piece still shows the granular structure of the original rock. The rounded lumps are of the same origin, but are impregnated with the white iron sulphide, marcasite. Any of the rocks may be, and probably are, auriferous. The alteration is due to crushing and shearing of the rock along a plane of faulting, and the subsequent oxidation of its individual constituents, together with the infiltration of iron sulphide.

A Hydraulic Mine in California.

Written for the MINING AND SCIENTIFIC PRESS
By D'ARCY WEATHERBE.

The Spring Valley mine is situated at Cherokee, about seven miles due north from Oroville in Butte county, California. It is one of the few hydraulic mines still in active operation, having partly survived the disastrous effect of the wholesale enjoining of such work by the litigation that followed the 'debris agitation' in the early '80s. It is, however, but a shadow of its former self—from a miner's view-point.

Discovered by the Argonauts in the greatest prospecting expedition the world has ever witnessed, the deposit was worked by pan, rocker, and sluice, by individual locators up to the year 1858, when hydraulic work, then in its infancy in California, commenced. This continued unbrokenly until 1879, when litigation interfered with further progress. Up to 1870 the water supply consisted solely of the drainage from a surrounding territory of about 110 square miles. In that year there was installed a supply system, the plans for which were decided by the engineers of that period. How successful they proved, will be related. Reservoirs were built, ditches constructed, and a pipe-line of wrought iron, 30 in. diam. and 13,100 ft. long, was laid. In inverted siphon shape, it crossed the deep gorge of the Feather river's west fork, the perpendicular depression below grade being 902 ft. This pipe furnished 2,210 in. of water per 24 hours during eight months in the year. To secure a yearly supply, additional reservoirs and ditches were constructed three years later, and another pipe-line 34 in. diam. and 3,780 ft. long was added to the first. This also included an inverted siphon, the vertical drop of which was 630 ft. The greatest thickness of the piping was 0.375 in., at a point where the pressure equaled 384 lb. per sq. in. The headwaters of the Big Butte creek and the west branch of the Feather river gave the supply and the ditch system aggregated 52 miles, the average width was 5 ft., and the depth 3½ feet.

The duty of a miner's inch is the quantity of material that one inch of water (1.5 cu. ft. per min.) is capable of moving; it varies with the quantity of water, pressure, character of material washed, grade and width of sluices. The duty at Cherokee was reported to be 5.5 cu. yd., but the average duty at large hydraulic mines did not run over three cubic yards.

Originally this was one of the largest hydraulic mines in the State, and for 25 years employed between 200 and 250 men. At times it is said to have had 10 monitors at work throwing streams of seven-inch diameter. The bank was in places 500 ft. high, and it was not unusual for the debris, in caving, to bury the monitors and pipes 400 ft. away.

The bedrock is largely slate with veins of diorite coursing through it. This is covered with a layer of 'blue gravel,' varying in thickness from 10 to 50 ft. and consisting of cemented gravel and boulders which require blasting before washing. The 'blue gravel' was overlaid by what has been thought to be a separate flow, and is a layer of boulders from 3 to 15 ft. thick. Above this is a more valuable stratum which contained from $1 to $8 per yard; it is overlaid by layers of pipe-clay mingled with fine white quartz sand. The channel, which was at first only about 500 ft. wide, is at the present face nearly 1,000 ft. in width. By 1890, 4,800 linear feet of it had been worked. This included 150 acres, worked from surface down to bedrock (a thickness of about 500 ft.), and a like amount worked from the surface to within 15 ft. of bedrock—the hard cemented gravel being left in position. It is estimated that up to 1870 $5,000,000 in gold had been produced. From that date to 1886 there was

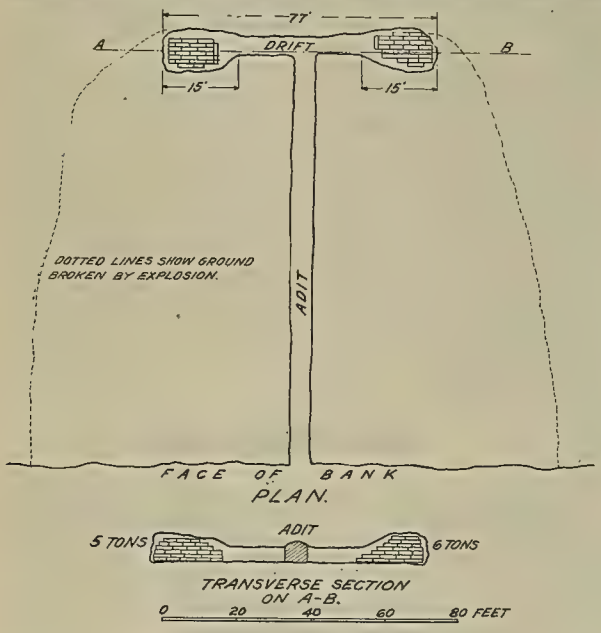


Fig. 4. Method of Blasting.



Fig. 3. Auger and Gun for Block-holing.

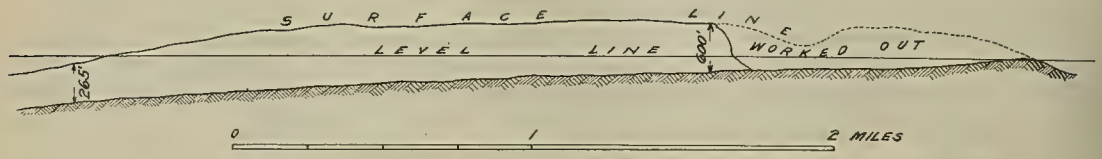


Fig. 1. Section of the Cherokee Channel.

$5,008,208 extracted; while mining expenditures, including land purchased for tailing ground, impounding dams, building reservoirs, debris canals, etc., was $1,862,244, and the cost of mining and caring for ditches, etc., was $1,759,953. The mine during all this period worked day and night, two 8,000 c.p. electric lights being used by night.

The tailing flowed through a canal 32 miles long, to two restraining dams 1,800 ft. wide, covering 12,000 acres of the land. Those intimately connected with the past working of the mine differ as to the further course of the channel, though in a general way the continuation under Table Mountain is known. Litigation, commencing about 1879, tied up the mine for many years, and the final sale of the water-power to the Spring Valley Water Company crippled its output immensely.

Fig. 1 is a sectional view showing the condition observed today, and Fig. 2 shows the present face of the bank. The grade of the bottom as shown in Fig. 1 is 4.5 in 100, steeper than the average inclination of these ancient channels, and this factor combined with its great width suggests the mighty torrent that must have flowed here in the geologic period that saw the advent of man. A section of the working face as exposed today, with the amount of gold contained in the several strata, is given below, commencing at the top of the bank and reading down to bedrock:

Material.	Thickness in feet	Value per cu. yd.
*Basaltic lava	80 to 100 in places	.....
Reddish pipe clay with layers of white quartz sand	325	.....
Yellowish sand with a little clay	90	$0.17
†Rotten boulder lead	5 to 10	$1.50 to $2.50
Light blue gravel	0 to 5	.....
Bluish cemented ground	25	$0.50
Sandy, blue, cemented gravel	5 to 30	.....
Total, not including basalt	465	$2.67

* Very little of this interferes with the working, as it is chiefly to the south of the channel.

† This is the stratum mentioned before as being the richest, and receives its name from the brown discoloration due to the oxidation of pyrite.

At this point therefore the averge value is less than two cents per cubic yard.

Only the natural drainage is now available, and, with the pipe installation that still obtains, this should supply water for at least six months in the year. During the past season, however, the mine was worked for about eight months due to the erratic and protracted rainfall through the State. Three monitors with 7-in. nozzle are in use, but not more than two are operated at once. The pipe-clay in the bank, referred to before, in caving often forms large lumps, which, when over 2 ft. diam., are broken by 'block-holing' or 'bulldozing.' Fig. 3 shows the auger and 'gun' used in this process. About ten boxes of Judson powder (50 lb. each) are used in this work. For the rock or cemented gravel, giant powder is required.

At long intervals—generally once or more during a season—'bank blasting' is resorted to, to assist in caving a large mass of material for sluicing. The last blast took place over a year ago and was done in the dry season, and in the following manner: An adit (Fig. 4) was driven for 115 ft. into the pipe-clay at a height of over 100 ft. above the bedrock—and a drift made each way from the end, the length of the drift being 77 ft. At the ends of the drift, chambers were excavated 15 ft. long and in these were placed five or six tons of Judson powder, these charges being fired by electricity. The dotted line shows the ground caved by the blast. It is proposed during the coming autumn to explode a blast of between 45 and 50 tons of dynamite. Only about 12 to 16 men are employed at the mine at present.

The gravel is sluiced down a cut in the bedrock, followed by 100 ft. of box-sluice paved with boulders and containing mercury, and then down an inclined shaft 125 ft. to the main drainage tunnel, which is 3,400 ft. long and cut through the rock. From here the flow enters a ravine and follows it down to the tule lands and im-



Fig. 2. Face of the Gravel Deposit.

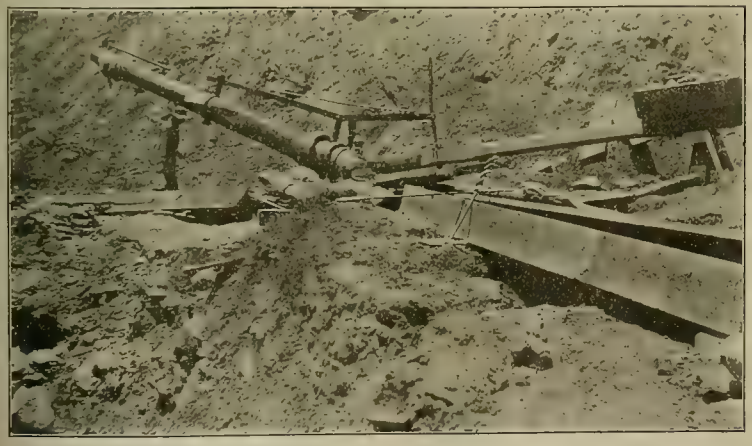


Fig. 5. Seven-inch Monitor at the Spring Valley Hydraulic Mine.

pounding dam mentioned before. The rock-tunnel contains a six-foot wooden flume paved with boulders and an undercurrent 24 ft. long and 20 ft. wide is placed near the end; the grade of the sluices is 6 in 16; 1,200 lb. mercury are used during the season, at the end of which the clean-up takes place. At several times during the history of the mine, notably when troubled by litigation relating to the debris problem, it has been suggested that it be worked by the drift system, and surveys have been made for that purpose. This proposition has again been brought up, and it is said that a tunnel 1,500 ft. long will reach the 'rotten boulder' lead in the channel, from the side of the ravine and through the rim-rock. As shown by sketch, the channel, if following on its present course and grade, would (at a point 1¾ miles down stream from its present face) lie at a depth of 265 ft. below the surface. Until this and the question of whether the gold content continues, have been proved by drilling or shaft sinking, the value of the scheme remains in the realm of conjecture.

RUSTING OF IRON AND STEEL.—There are three important differences between iron and steel which ought to cause a difference in their rapidity of rusting: First, blow-holes; second, manganese; and, third, the presence of cementite in the steel and of cinder in the wrought iron. Blow-holes exist in steel, but not in wrought iron. But blow-holes, at least those which do not weld up and thus cease to exist, are not necessary. Yet they are to be prevented only by care and skill. Hence, get your steel only from careful and trustworthy makers. Manganese steel always and almost necessarily contains more manganese than wrought iron. This may or may not hasten its rusting. If it does, then its effects ought to be made manifest even in short time tests, but tests do not show that steel rusts materially faster than wrought iron. Steel is generally richer than wrought iron in cementite, the iron carbide. Wrought iron always contains much more cinder than does steel. Of the two, the cinder of wrought iron ought to gain more than the cementite of the steel in its value as a mechanical retarder of corrosion as time goes on and more and more of the metal is eaten away. The reason for this is that the cementite is in such minute microscopic plates that the eating away of a small quantity of the steel from above them ought to bring very nearly the full proportion of this cementite to the surface; whereas, the much larger and more distantly scattered plates of cinder in wrought iron would not constitute their full share of the surface until a much thicker layer of initially overlying metal had been eaten away. This, then, may be the true explanation—that is, the reason why steel does not rust faster than wrought iron in our direct tests though it does in actual use—that our direct tests are too short to bring out the full protective action of the cinder of the wrought iron. Or the reverse may be true. As time goes on the harmful effect of the difference of potential of the cinder may grow more than its protective action. Let us, therefore, henceforth push our tests to destruction.—*Industrial World.*

AIR MAINS.—Pipes supplying air to rock-drills should be of a size to permit the passage of air at a velocity not greater than 25 to 30 ft. per sec., while all bends and angles (especially short ones) should be avoided, as they add greatly to the friction of the air, and thus decrease the pressure. The friction of the air is proportional directly to the length of the pipe, and to the square of its velocity. For this service, pipes up to 5 in. diameter are provided with couplings, above that with flanged joints made up with gaskets. Great care must be taken that these joints are perfectly tight, as the loss, even from a pin-hole, is considerable.

The Huntington Mill.

In the Huntington mill a special principle is brought into play. The rolls are suspended vertically from their revolving frame or head, and crush by their centrifugal force as they roll upon the steel ring forming the outer circumference of the mill. For many years the Huntington has been in use as a competitor to stamps, and lately it has been largely introduced for re-grinding the coarse tailing in concentrating mills. It is claimed for it, that:

(1.) The cost of the same capacity is not more than one-half that of stamps.

(2.) Freight to the mill where it is to be erected, one-fourth that of stamps.

(3.) Cost of erection, one-tenth that of stamps.

(4.) It runs with but one-third the power per ton of ore crushed.

(5.) The wear is less than with stamps. This follows as a corollary from 4.

(6.) The wearing parts are easily duplicated.

(7.) The discharge is freer and more effective, leaving the pulp in better condition for concentrating.

(8.) It is also a better amalgamator, nine-tenths of the gold being caught inside the mill, the balance being saved upon plates in the usual manner.

(9.) Simplicity of construction, so that less mechanical skill is needed.

(10.) Crushing action is continuous.

The Huntington mill is best suited to pieces of one-half inch and less in size and the feed should be regular. One difference between it and stamps is that the centrifugal motion throws outward against the crushing ring the heavier portions of the ore, whereas in the stamp-mortar the lighter and smaller particles of the ore are the ones which intervene between the crushing surfaces of the shoe and die. Again, the mercury is not beaten or pounded between the grinding surfaces and thus it is but little floured. The mercury, it will be remembered, is carried as a layer or pool upon the bottom of the pan. The crushed product, coming through the screens, is more granular than with stamps and hence (and this for re-grinding is one of the greatest arguments in its favor) is better suited to concentration.

When working upon ordinary gold-quartz the capacity of a 6-ft. mill in 24 hours is 30 tons with 55 rev. per min., taking 8 h.p. to run it. This is for partly crushed material one-half inch and less in size, and crushing through about No. 3 sheet metal screen (one millimetre wide).

LANGUAGE looks rather to *de facto* than to *de jure*. In our aim to keep language stable and conservative, we may justly oppose changes introduced by the careless into the meaning of words; but, when we try to undo changes which have already occurred, our task is often hopeless. Then instead of being the conservers we ourselves are the changers. Indeed, unless the advantage to be gained is great, it is doubtful whether an attempt to reverse a change, which is already established, is justifiable. This is especially true when the change which we would reverse is a natural expansion, growing out of the development of our conceptions and of our knowledge.—H. M. Howe in *The Metallographist.*

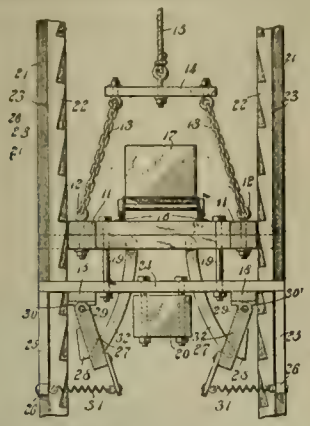
THE first stamp-mill in Alaska was erected in Silver Bow basin in 1883, and shortly afterwards John Treadwell built a five-stamp testing mill on the Paris creek lode and organized the Treadwell Mining Co. In 1884 the company erected its first large mill of 120 stamps. Since then operations have been increased, and now there are in operation, or in course of construction, in the vicinity of Juneau and Silver Bow basin 1,500 stamps.—*Douglas Island News.*

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

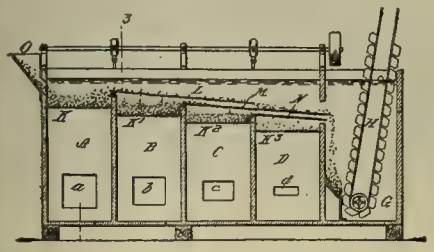
SAFETY DEVICE FOR MINE-CAGES.—No. 825,334; Charles Mulhearn, Freeland, Pennsylvania.

In a safety mechanism for elevators, members having rack-teeth, a platform moveable relative to said rack members, trip-arms swinging laterally and moving toward and away from said platform and adapted to engage said rack-teeth, coupling means between said trip-arms and platform, and a weight associated with said trip-arms and operating to maintain them normally spaced from the platform.



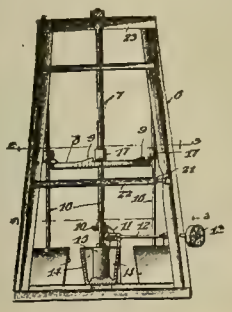
COMBINED SCREEN SIZING AND JIGGING APPARATUS FOR ORES.—No. 826,178; George O. Marrs, Walker, Arizona.

In a combined apparatus for jigging and size-screening, comprising a series of jigging-compartments provided with horizontal perforated partitions and a series of screens and at a higher level than said partitions, each screen being arranged to receive the overs from one compartment and to deliver the finer material to the next compartment in the series while conveying the coarser material away from said compartment.



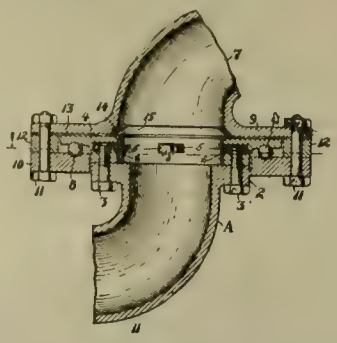
STAMP-MILL.—No. 826,726; John Hunt and Charles A. Hunt, Los Angeles, California.

In a stamp-mill, a horizontally-revoluble cam-wheel; wedge-shaped cams upon the upper surface thereof; a vertically-movable stamp having stems projecting upwardly therefrom and passing in close proximity to the periphery of the cam-wheel; tappets rigidly secured to said stems of the said cam-wheel and adapted to be engaged and lifted and revolved and dropped by the cams on the cam-wheel, said tappets having a ball-race in the bottom of each; and balls in said ball-race.



BALL-BEARING FOR HYDRAULIC GIANTS.—No. 826,931; Morris L. Gordon, Seiad Valley, California.

An improved hydraulic giant having in combination a pipe-section provided with an annular flange, a nozzle-section having an annular flange about its base, a packing-annulus interposed between said flanges, said annulus having radial recesses, bolts extending between the flange of the pipe-section and the annulus, nuts fitted to the bolts and located in the radial recesses of the annulus, a wearing-ring secured in the nozzle-section and underreaching the annulus, a packing between the annulus and flange of the nozzle-section and antifriction-rollers between said annulus and the wearing-ring.



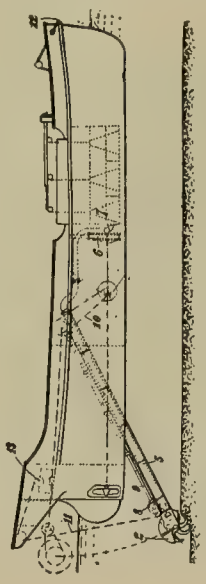
MINER'S TOOL.—No. 826,569; Ole Hanson, Mercur, Utah.

A pocket-knife having an end portion of the back-spring extended and terminating in a spring crimper member, a second crimper member co-operating therewith, means for actuating the second crimper member, and means whereby said actuating means is adapted to force the first crimper member toward the second crimper member.



DREDGING-MACHINE.—No. 826,993; Louis Coiseau, Paris, France.

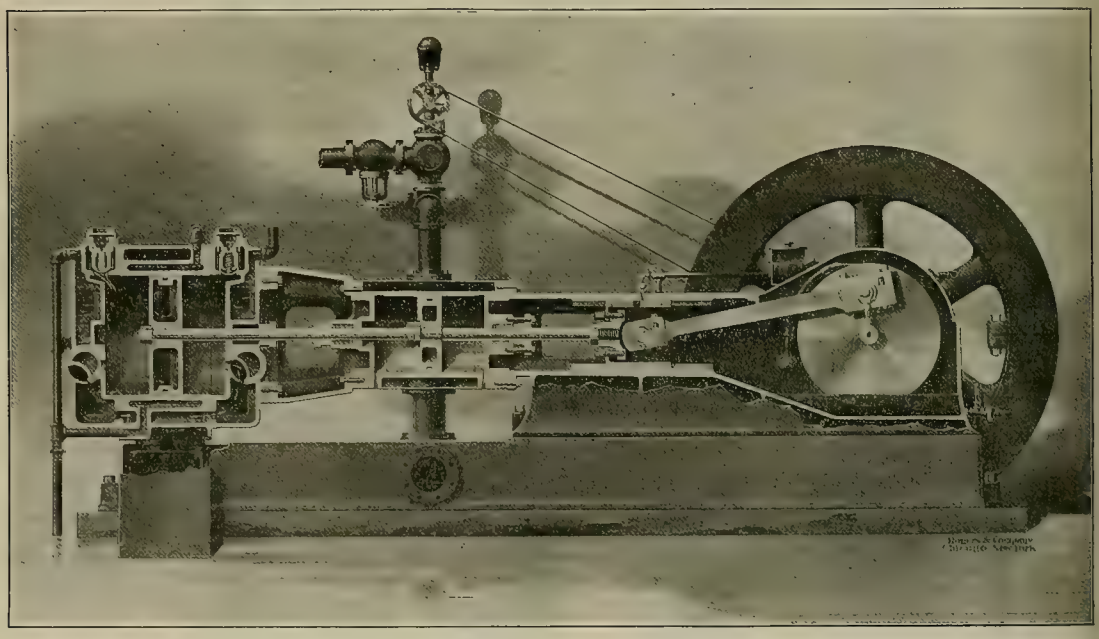
Suction dredging-machine having a vane-wheel bearing on the surface which is required to be dredged, a half-drum in which the vane-wheel is rotatably mounted, a suction-pipe, a pump or an ejector connected to the upper part of the suction-pipe, an orifice provided in one of the cheeks of this drum, for receiving the lower end of the suction-pipe, and an adjustable opening provided in the other cheek of the drum opposite to the suction-orifice.



A New Air-Compressor.

The accompanying engraving illustrates a new type of Sullivan air-compressor, which is particularly suited to the requirements of mines and quarries, as well as for industrial purposes of various kinds. This machine is of the duplex pattern, and is built in several combinations of steam and air cylinders, also for belt and power drive. The dominant feature is the box frame, with housing, which forms a tight enclosure about the crank-discs, main bearings, eccentrics, connecting rods and cross-heads. This housing excludes dust and dirt, and permits the use of a system of self-lubrication of the principal working parts. As shown in the sectional view, an oil well is provided in each frame, in which the lower edges of the crank-discs are immersed. The oil clinging to the discs is removed by scrapers in contact with their upper edges, and thence conveyed, by means of a storage chamber and suitable pipes, to the main journals, crank-pins, eccentrics and cross-head guides, being finally returned to the well by gravity, to be used again. These machines require the minimum of attention and care, as it is necessary to add oil to the wells only at long intervals.

These compressors are compactly and substantially built.



A New Sullivan Air-Compressor.

All sizes, except those of largest capacity, are mounted on a heavy sub-base, in which the inter-cooler and steam reheater (on cross-compound machines) are situated. The frames are of the heavy duty type or Tangye pattern, with long bearings on the base, securing rigidity, and maintenance of correct alignment of working parts. The steam valve-gear is controlled by a Meyer adjustable cut-off, the throttle being regulated by a sensitive steam and air governor. The air-cylinders are not cored out, but instead, separate liners are forced into the castings, thus precluding shrinkage strains. The space between the liner and the cylinder forms the water-jacket, and outside of this again is the air-inlet passage. Incoming air is thus admitted to the cylinder without contact with heated walls. The air-cylinder heads are also water-jacketed, and in two-stage compressors an efficient inter-cooler is provided, consisting of a nest of cold-water tubes, made of copper, with whose cold surfaces the air is forced to come into intimate contact in passing from the low to the high-pressure cylinder.

The inlet valves on all air-cylinders are of the semi-rotary or Corliss type, and are moved by steel valve-stems, connected by adjustable connecting rods to independent eccentrics on the engine-shaft. The moving parts start from, and arrive at, the ends of their travel with a slow and easy motion, but at the points of opening and closing of the valves, these points attain their greatest speed; it is thus possible for the valves to remain open during the entire stroke, allowing the cylinder to fill with air at barometric pressure, and trapping it instantly before the piston begins its return. The valves themselves are made of close-grained semi-steel, of large diameter, fitted with accuracy. Provision is made to permit a thin film of air to get behind the closed valve, pressing the cutting edges to the seat, and making the valve tight against leakage. The valve-stems have T-shaped heads on their inner ends, carefully planed and fitted to the slots in the ends of the valve. The attachment is such that the valves are free to follow up wear automatically without hindrance from the stems. These valves may be removed through the back bonnets without disturbing the setting of the valves. These compressors are made by the Sullivan Machinery Co., of Chicago.

Commercial Paragraphs.

THE CHAPMAN SMELTING WORKS CO., formerly of San Francisco, are now permanently located at 625 Myrtle St., Oakland, Cal. They are in the market for buying and treating antimony ore, for which they offer prompt cash settlement.

THE ATLAS ENGINE WORKS, of Indianapolis, whose Chicago sales offices have been in 900–902 Fisher Bdg., will, upon completion of the new Fisher Bdg., increase their present quarters by the addition of several large offices.

THE tube-mill manufactured by the COLORADO IRON WORKS CO., of Denver, Colorado, is especially designed for fine-grinding of ores in cyanide solution. The Dorr classifier, also manufactured and sold by this concern, is adapted to the separation of flocculent slimes from the purely siliceous material. The tube-mill not only effects fine pulverization, but brings every minute particle of material into direct contact with the solution and affords all the aeration necessary. This company also manufactures grinding-pans for fine-grinding in connection with cyanide treatment or amalgamation. One of these pans was recently installed in a Homestake mill, in the Black Hills, South Dakota.

Publications Received.

Production of Asphaltum and Bituminous Rock, and of Tin in the United States in 1905, being advanced sheets of the 'Mineral Resources of the United States.'

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Editorial.

THE AMERICAN MINING CONGRESS is to meet at Denver on October 16 and to remain in session four days. A special effort is to be made to kill dishonest mining finance, and to that end a strong committee has been selected to draft a bill, which, it is hoped, will become a law.

IT IS STATED that ore so rich in copper glance or chalcocite as to contain 50 to 65 per cent copper is being mined on the 2,400-ft. level of the High Ore mine, at Butte. This ore is sacked for shipment to the Anaconda smelter and it is stated to come from a vein nearly six feet wide. Apart from its economic importance as a fact indicating the persistence of rich veins of copper to a maximum depth, it is interesting as indicative of a zone of secondary enrichment so deep as to oppose the idea that such redeposition is necessarily of small extent. While these workings in Montana are only half as deep as those in Michigan, it must be remembered that in the latter case the copper occurs native in a bed of conglomerate, while in the former the metal is found as a sulphide, precipitated from the descending waters that have leached the lodes at a higher geological level.

WASTEFUL METHODS in mining are often due to the richness of the ore, they represent an extravagance unrestrained by necessity. When, however, an engineer lectures on waste in a region of low-grade ore such as the Rand, we take it that the lack of strict economy becomes an extravagance because it is multiplied by an enormous tonnage. The thoughtful remarks of Mr. Sidney Jennings will prove suggestive, not only to those in charge of mines at Johannesburg, but also to managers of mines elsewhere. In order to be economical, it is necessary to know what others are doing, for the manager of a single mine or group of mines is not likely to be able to arrive at the best result in each department by his own initiative. Comparison of ideas and borrowing of experience are more effective than individual experiment. In this regard the Rand has been fortunate, for not only have the mines under a single management profited from the work done at the different members of a group of properties, but the capitalists in control have encouraged the engineers to visit other regions where particular problems had already been met in the course of mining practice.

THAT PROSTITUTION of modern journalism, the Hearst newspaper, is becoming unpopular among Americans in Mexico because of the anxiety created by the wild stories printed in the 'Morning Screams' and the 'Evening Howls,' from New York to San Francisco. A mining engineer telegraphed to us a couple of days ago to state

that the reports as to trouble at Cananea were false. There are about 200 soldiers quartered in the various camps of that region—Cananea, Ronquillo, and Chivatera—not to mention the heavily armed police. No outbreak is expected and there is no reason to anticipate any at present. By their reckless tales of impending revolution, the Hearst papers spread distress among thousands of American homes, the bread-winners of which are engaged in mining in Mexico. Incidentally W. R. Hearst is benefiting the telegraph companies—people against whom those of us who live in San Francisco still feel resentment for their meanness during the days of the earthquake-fire. Thousands of telegrams are prompted by the yarns concerning trouble in Mexico, such despatches voicing the anxiety of those at home and conveying the assurance of those abroad. To punish the total disregard of decency on the part of the journals mentioned, many Americans—quite independently of their political affiliations—have discontinued their subscriptions. If, in addition, the respectable local papers of the country would forbear re-printing Mr. Hearst's balderdash, there might be a hope of stopping such criminal foolishness.

On Writing Clearly.

On another page we publish a lengthy extract from a pamphlet giving suggestions to authors of papers on economic geology, prepared by Mr. S. F. Emmons, for the United States Geological Survey. While intended for a special purpose, it will be of obvious use to a wider circle of writers and among others to mining engineers, not only in the writing of articles, but in preparing reports on mines. As Mr. Emmons says, "the writer should keep constantly in mind the fact that the primary object is to present to the reader a clear picture of the region described rather than to give an exposition of the mental processes by which his results have been obtained." This is well said, as is also the advice that "direct, simple statement of facts is more to be desired than rounded periods, rhetorical flourishes, or studied originality of expression." Another injunction is worth quoting: "The writer should bear in mind that an economic report is intended for readers who are not necessarily technical geologists, and he should therefore avoid, as far as possible, technical words with which they are not likely to be familiar. When the use of such words is unavoidable their meaning should be explained in parenthesis or footnote." This applies directly to those who make reports on mines; with many engineers there seems to be an idea that profundity, not to say obscurity, is impressive; and we confess that there is reason to believe that some investors appear to like a report couched in terms unintelligible to them because they think it emphasizes the highly scientific training of their technical advisor. However, such simpletons are becoming scarce, and the day is near when directness and clearness of expression will be understood to be the sign of clear thinking and thorough knowledge of the subject in hand. Meanwhile, it is well for the officers of the Survey to set an example; among the writings published by this department of the Government there are many publications needlessly verbose and painfully burdened with uncommon terms. Such matter fails to fulfill its primary purpose, which is to give useful information to the public. And if this criticism is made, it is with the thorough appreciation of the fact also that among the reports and bulletins issued from the office of the Survey are a number of treatises and descriptions in economic geology so carefully prepared and so lucidly written that they stand as models in the literature of applied science.

Scarcity of Labor.

From the older mining towns of California there comes a plaint that workmen are scarce, and this scarcity is imputed to the building operations in progress at San Francisco, San Jose, and Santa Rosa. But in the cities on the Bay there is urgent need for more workmen. It is stated also that many of the men who have long worked in the mines of the Mother Lode have been attracted by the opportunities offered to prospectors in Nevada. But in Nevada also there is a demand for more miners than are available. From Michigan we learn that the copper mines need more laborers and that the lumber companies are perplexed by the shortage of woodsmen. The same complaint comes from the iron mines of the northern country. James J. Hill states publicly at St. Paul that despite an immigration of 1,000,000 people per annum, labor outside the cities was never as scarce or wages as high as at the present time. Bisbee, Cananea, and other copper mining centres of the Southwest are in want of men. Without going into further detail, it can be said that similar conditions obtain all over the West and in parts of the East. There is a general scarcity of labor in the United States. Nor is this the only country thus affected; we know that as regards mining there is a labor famine in South Africa and in Mexico. Is this condition to become aggravated?

It is apparent that the industrial activity of the United States is calling for an increased supply of labor, in order to complete works already undertaken. The demand exceeds the supply, partly by reason of the expansion of industry and partly because the hours of labor are shorter. Working days of ten or twelve hours are becoming almost universally replaced by the eight-hour day and, it must be confessed, without an equivalent improvement in the quality of the service rendered. Where a thousand men did a certain amount of work in a thousand working days, we now need nearly 1,500 men to achieve the same result. The shorter hours and the consequent increasing cost of labor have prompted mechanical invention, whereby a machine with one or two skilled men does the work formerly done by a great many unintelligent laborers. Save for the help obtained from machinery, the situation would be even more acute. But if industry progresses and the working population does not increase proportionately, while slowly tending toward a universal eight-hour day, what is to be the outcome? In Nature and in Art there is a principle of compensation, the tendency of which is to correct all excesses. The inevitable result will be a period of industrial depression.

By the Way.

In a recent issue of *Science* there appears an authoritative and suggestive article on 'The Nature and Origin of Volcanic Heat' by Professor Elihu Thompson. He says:

The hypothesis of a molten or more or less fluid interior, as possessed by the earth, may now be said to have been abandoned, and along with it the supposition that volcanoes constitute vents for the escape, as a consequence of shrinkage and subsidence, of a portion of the molten content lying everywhere under the solid crust. The hypothesis that the interior of the earth, while in the main solid, has cavities containing melted matter which occasionally is forced out in the form of eruptive outbursts, is a kindred one which has found some adherents. But a truly solid interior seems to be demanded by the accepted great rigidity of the body of the earth, and Mallet has put forward the idea that extraordinary pressures exerted to crush the rocks would result in their becoming heated and melted. Evidently, however, mere pressure acting alone, however great, would not suffice for this. Incipient fluidity would substantially put an end to the crushing process and heat generation would stop. The observed high temperatures attained by volcanic products during eruption would not be reached. More recently the thermal effects of volcanoes, and the various results thereof, have been ascribed by one authority to the presence of radium, which, as is known, continuously gives out energy in its breaking up. But volcanic lavas have not been found to be sources of radium or of uranium, the amount of which should be quite large if the supposition is to be given any serious consideration.

The object of this paper is to present a view of the origin of volcanic heat which may possess some elements of novelty and, it is hoped, of rationality. According to this view, much of the heat manifested is due to mechanical work converted into heat—a theory based upon dynamical principles to be later pointed out. Primarily it will be admitted that any substance, gas, liquid or solid, upon which work is done, acquires heat in proportion to the energy expended upon it, which heat, if prevented from escaping, at once results in an increase of temperature of the substance. If the mechanical energy so converted be of known amount, we may calculate from the mass and specific heat of the substance or body upon which such energy is expended the rise in temperature. Even if air at ordinary temperature under high pressure escapes through a tortuous or frictional passage surrounded by a good heat non-conductor, it emerges hot. The higher the pressure and the greater the friction met in the passage the greater the increase. The heating is directly related to the work done upon the mass.

If a liquid be substituted for the air the general result is the same, and the liquid may be made to boil upon its escape. If a somewhat plastic solid like hard pitch be subjected to the process, the energy required will be greatly increased, or the pressure required to force it through the tortuous passage of some length will be great. It may emerge hot and melted if the conditions be properly selected.

If now it be assumed that any solid be subjected to a pressure such as to cause it to flow in a tortuous or restricted channel, it will, in so moving, rise in temperature, and continue so to rise until it has reached a degree of fluidity such as to lessen or practically stop the absorption of energy in moving the mass; or until it escapes from the passage through which it is being impelled. The pressure is but one factor of the energy, the other being the distance through which the pressure acts. The pressure required depends upon the resistance to motion, which in turn is greater with more rigid bodies and greater with increase of distance through which friction is met and overcome. The pressure or force required will be at a maximum when the solid mass starts cold or nearly so and will diminish as the temperature is raised and consequent plasticity or fluidity brought about. A rock mass forced to move under great pressure over distances of thousands of feet must soon become melted in the process. It is not necessary to assume that the mass so heated starts cold. It may start at any temperature at which it possesses sufficient rigidity or viscosity to require the exertion of great force to move it in the assumed restricted or tortuous passage or channel. Great velocity of movement in such passage means of course great energy expenditure and rapid heating. The idea thus outlined may now be applied as an explanation of volcanic phenomena. For example, a hot-water spring may be the result of the water having been forced by high pressure to traverse somewhat porous rock, or to pass through narrow but long fissures in which it is churned for a long time before escaping. In like manner any rock mass which, subjected to very high pressure, begins to flow, must become heated. If its distance of traverse be great enough in a restricted fissure or channel, it must melt, or even become so heated as to partially vaporize when the pressure is relieved, as when it finally escapes. Let it be admitted that the flexures taking place in the earth's crust or in the outer portions of its mass may bring to bear upon deep-seated and perhaps already heated solid rock masses a sufficient pressure to cause them to readjust their positions, and the condition demanded by the theory is present. Such a condition would mean movement of such masses over considerable distances at high pressures, with the final result of the formation of molten streams ready to escape upward from the pressure exerted upon them. A vent would at last form and the rush of the partially melted rocks towards and out of this vent would become a lava flow. These actions would naturally occur at places of flexure such as would tend to form a ridge, and the loading and sinking of sea bottoms as a consequence of sedimentary deposits would be favorable, as is well known, to such flexure as would tend to heavily compress the rocks along the line of flexure deep down from the earth's surface, while relieving or not increasing pressure near the surface. The compressed rock would in general tend to be shifted or made to flow outward at the line of flexure. This view accords well with the facts. Volcanoes exist along lines more or less parallel to or adjacent to sea coasts or along the weak lines in the earth's surface. It will easily be seen that a single volcanic vent or pipe may serve to relieve or provide a point for outflow for the shifting of material over a great length of flexure deep down under the earth's surface. As the flow and fusion would be a somewhat gradual process, it may well be that only when the vent is about to open will there be earthquakes and great subterranean noises, more or less local to the place of outbreak. Very probably eruptions in which melted lava does not appear to have a part, but in which steam and gases, sand or mud are ejected, are nevertheless dependent upon an upthrust of lava or a subterranean lava stream, which never reaches the surface, but the temperature of which is such that, on its reaching hydrous rock strata, the water is evolved as steam at high pressure, which, entering superincumbent layers, gives rise to mud eruptions, or escapes from vents or fumaroles.

It would be expected that such rock masses as, under pressure, would yield most readily would be the ones to flow and form lavas. They would also be likely to be the more readily fusible masses, assuming that before the process of compression and extrusion begins they exist at a temperature more or less elevated above that at the surface of the earth.

Special Correspondence.

London.

Annual Report of the Mt. Morgan. — The Great Gold Mine Now Produces Copper.

This is in many respects the greatest gold mine ever worked by man, for its output has been $59,341,000, from which dividends have been distributed to the amount of $32,646,358. The mine began to be productive in 1886, and it promises to be a source of great wealth for many years to come. During the past fiscal year the production was 121,606 oz. of gold, equivalent to about $2,432,000. Under the hill of gossan constituting the immense outcrop of the deposit, there has been found sulphide ore rich in copper, and in their last report, this new feature of the enterprise is emphasized.

The directors state that the chief feature of the past year has been in connection with the erection of the copper reduction works and the necessary equipment of the mine for extracting the auriferous copper ore. The works, which consist of three blast-furnaces and two converters, are capable of treating 10,000 tons of ore per month, and provision has been made for additions which are now under consideration. The first blast-furnace was blown in on January 20, and the converter commenced operations on April 18. Progress was at first slow, but the whole plant has given complete satisfaction. The production of bessemerized copper to June 30 amounted to 484 tons, of which quantity 302 tons were produced in the last month, the whole containing approximately 7,085 oz. gold. The blister copper produced averaged 98.6% pure copper, and contained at the rate of 14½ oz. gold per ton. A contract for the purchase of the first year's output was entered into with the Delmar Copper Refining Co., of New Jersey. The question of erecting an electrolytic refinery has not been settled finally, but will receive attention early enough to have everything complete during the term of the contract, if found advisable. The copper-producing operations have not extended for sufficiently long periods to determine the cost of mining, smelting, and realization, but sufficient is known to show that the estimate made when the equipment was decided upon (35s. per ton of ore) allows an ample margin.

The reserves of the auriferous copper ore were referred to in detail last year. Since then no prospecting has been done, but openings made for extracting it have shown that the quantities are somewhat greater. These estimates showed that 1,212,000 tons, containing approximately 3½% copper and 8 dwt. gold; 1,597,000 tons, containing approximately 3% copper and 2½ dwt. gold; and large unestimated quantities, containing from 2 to 3% copper, and from 1 to 2 dwt. gold. However, sufficient is known of this latter low-grade ore to show that it is very extensive, exceeding in amount the aggregate of high and medium grades. The prospect of turning this low-grade ore to profitable account has been considered so great that the equipment of the mine has been determined largely with a view to that object. In the works, as built, space was left for two more furnaces, in addition to the three already in position, and provision was also made for extending the converter plant. This means of increasing the output will have early attention.

Turning to the mine as a gold producer, it is seen that the output was 114,521 oz. of fine gold from 280,718 tons ore. The average assay-value of the ore was 9.16 dwt., as compared with 9.71 dwt. for the previous year. The amount of oxidized ore extracted from the open-cut workings was 135,210 tons, which yielded 52,882 oz. gold. The average yield per ton was 7.82 dwt., compared with 8.41 dwt. for the previous year, which shows a decrease in the grade of 0.59 dwt. The amount of sulphide gold ore treated was 108,736 tons, which yielded 58,866 oz. gold, averaging 10.82 dwt. fine gold, which is about 5% lower than the previous year.

An important consideration in connection with the immediate future of the mine is the limited quantity of better grade oxidized ore now available. "Most of this ore," the directors say, "having been treated, a further reduction in the yield from the oxidized ore may be looked for." The grade of oxidized ore during the past year was materially assisted by the ore uncovered by the steam shovels in the removal of the overburden on the east side of the mountain. The better grade ore thus provided is, however, becoming exhausted, and although the removal of the overburden continues to disclose fresh bodies of ore, the latter discoveries have been low in grade or containing too large a percentage of pyrites to permit of treatment at the oxidized ore reduction works. The main supply of the oxidized ore was obtained from the western side of the mountain, where the ore continues low in grade, the average for the year only slightly exceeding 5 dwt. gold per ton.

The accounts for the 12 months show that the period opened with £18,771 in hand, and closed with a balance of £4,922, after the payment of £150,000 in dividends. The total disbursements for the year were £654,758, no less than £266,419 having been paid in wages.

Calumet, Michigan.

The Michigan's New Mill. — Winona to Start Milling. — Shaft-Sinking on the Wyandot. — The Seneca Property and Its Chances. — Diamond-Drilling at the Isle Royale and Rhode Island.

Shipments of ore from the Michigan mine to the mill of the Mass Con. Mining Co. on Keweenaw bay were discontinued this week, the Michigan's lease of one stamp having expired. The ore is now being shipped to the Atlantic mill, being transferred to the Copper Range railroad by the Mineral Range road. The Michigan has leased two heads in the Atlantic stamp-mill, which will be sufficient for its needs until its new mill is completed. There will be no increase in the production for some time. Work on the new mill, adjoining the Mass mill on Keweenaw bay, will not be completed for a year, as it will be necessary to wait several months for machinery and building material. Work on the foundation is now under way. The plant will consist of two stamps, and it is estimated that the cost will reach $180,000, which the Michigan company will undoubtedly be able to pay from current earnings without making an assessment. The ore is yielding better than 20 lb. copper per ton stamped, which is higher than the average secured by some of the dividend-paying mines of the Lake Superior district. The new C shaft is opening promising ground and will become an important factor as soon as it is provided with a rock-house and railroad facilities. These will be furnished without any further delay.

It is current gossip that the Adventure mill at Edgemere will treat the ore from the Winona mine, which will begin production within the next six weeks, or as soon as the new rock-house at No. 3 shaft is completed. There is much activity at the Winona property. The sinking of the new No. 4 shaft is being pushed as rapidly as the conditions permit, and as opening work is progressing from two points underground, simultaneously with sinking from surface, it is expected that the shaft will be opened to the third level in short order. Repairs to the foundation of the 15,000,000-gal. pumping engine at the Adventure's stamp-mill have started. Auxiliary pumps will be installed to furnish the water necessary

for use in the stamping and concentrating departments in the meantime.

The Wyandot shaft has reached a depth of 850 ft. and work is progressing continuously. It is purposed to put the shaft down to a depth of 1,000 ft. before lateral explorations are started. The shaft is in the foot-wall, about 75 ft. from what is believed to be the Winona amygdaloid lode, which has not been exposed below the fourth level. It is expected that the lode will be reached within a short time. As soon as the cross-cut reaches it, drifts will be started.

On September 20, the Calumet & Arizona Mining Co., with main offices in Calumet, will pay a quarterly dividend amounting to $700,000. The North Butte will disburse $800,000 on September 29 as a quarterly dividend, and the Wolverine's semi-annual dividend, payable September 31, will aggregate $540,000. The Copper Range pays its seventh quarterly dividend, amounting to $576,202, on October 1. These enlarged distributions of earnings among the shareholders of the various corporations, reflect better than anything else the extremely prosperous condition of the larger copper producing companies at the present time.

Occasional reports are circulated to the effect that the Seneca property, adjoining the Mohawk and Ahmeek, is to start operations, but it is not likely that any activity will result at that mine this year. The Ahmeek and Mohawk are doing well, and in a measure they are proving up the Seneca's prospects. The Calumet & Hecla Mining Co. has started a couple of shafts on its property lying immediately northeast of the Mohawk, with favorable results. The Seneca bears the same relation to the Calumet & Hecla's property, known as the Gratiot, that the Allouez does to the Ahmeek, the former in each instance being the 'deep level' of the latter. The Seneca is one of the most promising undeveloped properties in the Lake Superior copper district and undoubtedly will make a good-sized mine in time, but it appears to be the present policy of the company to permit the adjoining properties to develop their lands and thus prove the Seneca portion of the Kearsarge amygdaloid bed.

In addition to the two shafts the Calumet & Hecla Co. is sinking on its Gratiot property, it has four other shafts under way in Keweenaw county. These are situated on its Delaware mine, where diamond-drill exploratory work also is under way. Three of the shafts are on the Montreal river amygdaloid, and are known as No. 1, 2, and 3. The other shaft is on the Calumet conglomerate and is known as No. 6. No. 1 shaft, the first one started, offers the best showing. It is over 100 ft. deep, with drifts at the 100-ft. level, and the showing is understood to be above the average.

Sinking is progressing in the exploratory shaft which the Isle Royale Co. is putting down upon the Baltic amygdaloid lode. The shaft is about one mile north of the Superior's boundary line. At the Isle Royale's shaft in Section 11 the showing continues encouraging. This shaft, known as No. 6, will be prepared to furnish a larger production shortly. Diamond-drill work, to determine the best site available for a shaft south of No. has progressed slowly, owing to the large number of boulders in the overburden.

At the Rhode Island, diamond-drilling was discontinued a short time ago. One drill had been in commission for ten months at various points on the surface, finding the Kearsarge amygdaloid and determining its depth. Once the drill on the surface went out of commission, two have been in use underground. These drills are placed in the 1,200-ft. level of No. 2 shaft. They are being operated to disclose the West, Allouez, and Pewabic lodes at that depth.

It is expected that the cross-cut which the Franklin Co. is driving from the older workings at the Franklin Junior mine, to intercept the Kearsarge amygdaloid, will reach that formation within a few days.

Joplin, Missouri.

Prosperity of the Lead and Zinc Mines.—Activity at Webb City.—New Enterprises and More Concentrating Mills.

The highest price reported for zinc ore last week was $48 per ton. The assay basis was $42 to $44, with a few bins selling at $45 per ton for 60% zinc. Lead ore continues strong in demand and price, and $82.50 was reported paid for one bin in Webb City. From $80 to $81.50 was paid in Joplin. The zinc ore shipment for the week was 69 tons larger and the lead ore shipment for the week 59 less, with a decrease in value of $6,954, compared with the previous week. The shipment of zinc ore this year is 17,500 tons larger than the same period of last year, and the lead ore shipment is 5,000 tons larger and the value $1,303,994 greater. The shipments for last week were: Zinc ore, 5,419 tons valued at $238,318; lead ore, 710 tons valued at $56,583; combined value, $294,901.——The Grace Zinc Co., owner of a 20-acre lease on the Granby Mining & Smelting Co.'s land, at Chitwood, has completed a drill-hole to a depth of 161 ft., where a 25-ft. body of pay-ore was encountered. The drill has been moved and work on the second hole commenced.

The La Grande Mining Co., operating a lease on land of the Granby Mining & Smelting Co., has started its mill again this week and expects to be able to run steadily hereafter. The mine has been shut down for some time pending deepening of the shaft and further development work.——The Continental Zinc Co. turned in last week 141 tons of zinc ore and nine tons of lead ore, thereby heading the list of Joplin producers. This property is situated immediately west of the city and is an old and steady producer.——The Paxton mine, on the Missouri Lead & Zinc Co.'s land, owned by Conklin & Ritter, in which a rich run of zinc ore was found a few weeks ago, last week turned in 47 tons of zinc ore. Since striking the ore, and in cutting a drift, one of the richest bodies of ore ever found on the Missouri Lead & Zinc Co.'s land has been developed.

The concentrating mill of the Florence Mining Co., operating on the Guinn land, north of Webb City, which has been in litigation for some time, was purchased last week at private sale by F. C. Wallower, of Joplin, for the Disbrow Mining Co., composed of Joplin and Webb City parties. The mill will be moved to the Bradford-Kansas City Mining Co.'s lease, on which the Disbrow will operate.——H. F. Chapman, a capitalist from New York, has formed an organization to be known as the Royalty Land & Mining Co. The stock will be held by himself and a number of Eastern friends. The company recently purchased 20 acres of the Teel land, near Duenweg, and in close proximity to the famous Log Cabin and McAboy & Reno lead mines. The company will maintain an office in Webb City.——The Lelah Mining Co., composed of Ben Peppers, Cob Pugh, Roberson brothers, and others, of Webb City, operating on the Moss 40-acre tract north of Alba, which was recently purchased by T. F. Coyne, of Webb City, for $80,000, turned in last week 73 tons of zinc ore.

The Moss Mining Co., represented by the Hardy brothers and others of Webb City, and operating on the same property, (each company having 20 acres), turned in 44 tons of zinc ore. Each of these companies has just completed concentrating mills and is getting in shape to run regularly, and apparently have as good a property as there is in that part of the district.

Butte, Montana.

Production of Copper in August. — Strike in the Ophir. — Another Company Organized. — The Ida-Montana to Resume Operations. The Niagara Lessees Doing Well. — A Discovery in the Corra.

The Butte district produced in August 34,057,034 lb. of copper, the increase over the July production being but 135,660 lb. The different companies contributed to the August production as follows:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	116,250	8,835,000
Anaconda	126,480	9,106,560
Butte & Boston	18,600	1,320,600
Washoe	17,205	1,238,760
Parrot	11,501	699,670
Trenton	16,926	1,167,894
North Butte	32,581	4,329,150
Red Metal	42,625	3,026,375
Original	30,225	2,206,425
East Butte	6,510	637,980
Pittsburgh & Montana	4,960	357,120
Miscellaneous	15,500	1,131,500
Total	439,363	34,057,034

The daily output of ore and the average yield per ton in copper were as follows:

Company.	Tons.	Pounds.
Boston & Montana	3,750	76
Anaconda	4,080	72
Butte & Boston	600	71
Washoe	555	72
Parrot	370	61
Trenton	546	69
North Butte	1,050	133
Red Metal	1,375	71
Original	975	73
East Butte	210	98
Pittsburgh & Montana	160	72
Miscellaneous	500	73
Total daily output	14,171	

Total daily copper production, 1,098,614 pounds.

The recently organized Butte Central & Boston Copper Corporation owns the Ophir mine, in the southern part of the Butte district, in which lessees a few days ago made an important strike on the 300-ft. level, about 230 ft. east of the shaft. Average assays show 300 oz. silver per ton and 5 to 6% copper. The vein is believed to be one of those being opened in mines some distance east of the Ophir. The extent of the orebody has not yet been determined, the opening into it having penetrated but eight feet.

The latest company organized in Butte is the Butte Extension Copper Co., incorporated under the laws of Massachusetts. It has acquired four mining claims in the southeastern part of the Butte district, known as the Exemption, Canyon, Mountain Spur, and Colleen Bawn. Very little development work has been done on the claims, but they are regarded as good locations. There is a shaft sunk 150 ft., many years ago, on the Exemption, and a vein of copper ore about 10 ft. wide was cut. It is stated that all the ground has been bought and paid for.

The Eagle Mining Co. will sink its shaft 200 ft. deeper, and run drifts east and west at a depth of 400 ft. The Ida-Montana Mining Co., composed principally of Michigan and Wisconsin capitalists, is about to resume operations on its properties in the foothills east of Butte. The first shipment of machinery, ordered some time ago, has arrived on the ground. It consists of a new hoisting engine capable of working to a depth ot 1,500 ft., boilers to furnish 250 h.p., and a 16-drill air-compressor. A pump is also included capable of lifting 500 gal. of water per minute to a height of 1,000 ft. The property consists of two full claims, on which two shafts have been sunk on the vein, each about 115 ft. deep. It is the intention of the company to sink a three-compartment shaft to a depth of 1,000 ft. The lessees who are working the Niagara mine, recently purchased by the Butte & Superior Co., are still in possession of the property and are regularly shipping ore. The Niagara is a silver-gold producer, and is one of the oldest mines in the district, though it has never been opened below 300 ft. It is the opinion of many mining men that the Niagara, like all other mines, in the Butte district, will turn into copper with greater depth, and the Butte & Superior Co. will open it through the Blackrock shaft at a depth of 1,000 ft. or more.

The shaft of the Bullwhacker mine has reached a depth of 380 ft. A station will be cut at 400 ft., and cross-cut to the vein recently struck by the lessees about 100 ft. south of the main shaft.——The Red Metal Co. has opened on the 1,600-ft. level of the Corra mine the vein which the old company lost on the 1,400, where the vein was faulted.

Salt Lake, Utah.

Share Business for the Week.—Dividends From Tintic. — Freight Rates Considered Excessive. — News From Park City. — More Sampling Works.—The Nevada Douglas Copper Co.

The ore and bullion settlements last week in Salt Lake amounted to $612,200, making it the best week of the year. During the same period, on the Salt Lake Stock & Mining Exchange, there were sold 259,184 shares of stock for $110,868. The directors of the Lower Mammoth Mining Co., operating near Eureka, in the Tintic district, have decided to call a stockholders' meeting to discuss the matter of increasing the capital stock. Money is wanted to sink the main working shaft from the 1,200 to 1,700 ft. or deeper, making heavier machinery necessary. This creating and selling of treasury stock, rather than continuing to levy assessments, is considered to be the most satisfactory means of raising funds to provide for the proposed improvements.

Two Tintic mining companies have posted dividends this week. The Bullion-Beck & Champion pays 10 cents per share, or $10,000; the Uncle Sam Consolidated, one cent per share, or $5,000. The Daly-West, of Park City, has also posted its usual quarterly dividend of $108,000. ——A settlement of the question of freight rates on ore shipped from the Tintic mining district to Salt Lake valley smelters is still pending. Producers, as stated recently, have been making a united effort to induce transportation companies to grant them a lower schedule on certain classes of ore. They submitted a long list of figures showing the output of the district in the past and others showing what it might be were certain concessions granted, which would permit profitable shipment of ore assaying about $10 per ton. There are many thousands of tons of ore of this class available in Tintic mines which cannot be handled to advantage at the present time. Producers asked for a rate of $1 per ton on all ore of the value of $10 per ton or under—a reduction of 50 cents per ton—which the railroads refused. They were then asked for a rate of $1.25 per ton on ore assaying $15 per ton or under, with present rates to remain in force on everything going above $15. A decision from the railroads is expected this week.

Shipping ore has been found on the 800-ft. level of the Little Chief mine in Tintic district. Development work is to be resumed at the Naildriver mine, at Park City. The directors of that company have levied an assessment of three cents per share, to collect $9,000 for this purpose.——The development of a new orebody on the 1,200-ft. level of the Daly mine, at Park City, has created much local interest. Its extent, however, is yet to be determined.——Interesting developments have been taking place at the Treasure Hill mine, in the Snake creek district, near Park City. The property is about to make its initial shipment of ore.——The Ontario Silver Mining Co. is making a little more than expenses from

ore shipments, which are the product of the upper levels of the mine. Work is still progressing with the re-opening of the drainage adit.——The management of the Little Bell mine, at Park City, reports having marketed about 1,000 tons of ore in August.

Chicago parties have secured a bond and lease on the Copper Coin property in Morgan county.——Bert L. Smith of Tonopah, with others, has secured a bond on the Mountain Chief mine in Bingham, which is to undergo development.——Herman Barnett of Salt Lake, manager of the Cedar Mining Co., operating near Milford, Beaver county, reports having found a good body of silver-lead ore of shipping grade on the 225-ft. level of that property.

The Taylor & Brunton and Pioneer Sampling Companies, operating near Salt Lake, are preparing to provide additional equipment. The former will increase its capacity about 50%, 45,000 tons monthly.—— Much interest is being taken in Salt Lake over recent developments in the Yerington, Nevada, copper district where a number of Utah people have secured property. The articles of incorporation of the Nevada Douglas Copper Co. were filed last week and the management has started vigorous exploration. J. D. Wood, president of the company, is now on the ground to be present at the starting of the main adit. It is learned that the company will probably close a contract to purchase power from a plant situated on the Truckee river. In this event transmission wires will be strung promptly, insuring electric energy at the Douglas camp within 60 days. If this arrangement is concluded the Douglas Co. will be relieved of the necessity of making an investment in a plant of its own, although it has acquired good water rights and power sites. Should the pending power deal fall through, the original plans will be adopted.

Denver, Colorado.

Leadville Still Makes a Big Output.—A Strike in the Little Johnny. New Work at Silver Plume.—Sale of the Muscovite.—More Mills at Georgetown.—The Newhouse Tunnel.—News From the Dumont and Montezuma Districts.—Zinc From Breckenridge.

Leadville is producing 90,000 tons of ore per month, a greater tonnage than it ever produced in the past. This seems remarkable when one considers that Leadville began to produce in 1859. The Yak Tunnel company has taken over the control of the Fortune mine. This property is near the Resurrection and will be conveniently worked through the Yak adit. The Half-Moon Mining & Milling Co., also near Leadville, has this summer completed a good wagon-road to its property and installed a small plant of machinery. The manager is now getting out plans for a mill.——Some lessees on the Little Johnny have struck a rich pocket. H. Hawkins, one of the lessees, brought into town a 15-lb. piece that might fairly be called a gold nugget. The Ibex company, which owns the Little Johnny, has prospered under the leasing system and at the same time some of the lessees have also done very well indeed.

Two enterprises are starting on Long & Derry hill. Harry Mamlock, manager of the Doris mine, has opened a fine body of lead carbonate and is shipping actively. P. W. Breene has taken a lease on the Long & Derry mine. Mr. Breene will be recalled as the energetic promoter whose name was associated with many of Leadville's earlier enterprises. At present he is giving most of his attention to re-opening the old Col. Sellers mine. He is preparing to build a large concentrating plant for that property.

At Silver Plume, one of the mines that is attracting local attention, is the Smuggler group on Brown & Sherman mountain. Dr. Burt, manager for the Main Gulch Mining Co., has been developing this property and has opened up some extensive bodies of good ore. Assays as high as $225 per ton have been received. Some of the ore carries a heavy percentage of zinc; this ore is sent to the Terrible mill, where the zinc and lead are readily separated.——The old Lebanon tunnel, which has been idle for 20 years, is now shipping.

The Muscovite mine on Democrat mountain, near Georgetown, is reported to be sold to Denver investors for $50,000. This property was at one time a heavy lead producer and has of late been re-opened. In the early days, however, less attention was paid to securing surface rights than is necessary nowadays and difficulties arose over dumping room. The new owners plan to obviate this difficulty by going farther down the hill and driving a cross-cut tunnel. It is said that there is ore enough developed to justify a mill as soon as the new adit-cut reaches the vein.

The old mill near the portal of the Mineral Chief is being overhauled at present and will be run by the Linn Consolidated Mining Co., but it will not be large enough to handle the tonnage of the mine and additional machinery with 30 tons daily capacity will be provided at once. W. D. Hoover, the principal owner of the Griffith mine, has begun grading for a 50-ton concentrator. Work on the 50-ton concentrating plant for the Ramsdell Mining & Milling Co., is to be started September 10.

It is not possible to give all the news about each camp during these busy summer months. Upper Clear Creek is especially prolific in new enterprises. Ever since the Argentine Central Railroad was started this part of the State has been extremely active. They are paying men $3 and board in East Argentine now, and it is almost impossible to get men even at that attractive wage. Down at Idaho Springs matters are equally flourishing, but there are not as many new ventures. The developments from the long adits are the principal feature of the summer's work. The Pine Shade, the Gem, and the Saratoga all report fine discoveries in laterals from the Newhouse tunnel. The Gem in particular deserves mention, for they have the highest grade ore seen in the mine for many years. It was discovered in a winze sunk below the tunnel-level. At Dumont an engineer named Bohn has been running some cyanide tests for S. K. Behrend, of the Cass County Prospecting Co. The tests are just as successful as numbers of others have been in this district, when conducted by competent men, and it is probable that this company, as well as others, will add a cyanide annex to their mill in the near future.

George C. Weber, president of the Great Northern Mines Claims Co., operating on Mill creek, above Dumont, is planning a hydro-pneumatic plant of 50-h.p. capacity, to drive another long adit. Joel F. Vaile, the distinguished attorney of Denver, has done something in that line on Mill creek, and succeeded in demonstrating some interesting geological theorems which have been useful to him in his law practice. We will hope that Mr. Weber will get something else besides geological data.

The Montezuma district, in Summit county, seems to be sharing in the almost unprecedented activity which besets the mining parts of Colorado this year. Montezuma is not unknown; it may more properly be spoken of as forgotten, until this year; now the hills are alive with men and teams, and the regular boom of the shots at the close of each shift sounds like the bells of a Western Union clock. Ernest Le Neve Foster, the well-known mining engineer, has shown his faith in the district by putting 12 men to work on the Waterloo.

Breckenridge has come to the front this summer with unexpected production of zinc. It seems strange for a

camp noted chiefly for its gold-placer operations to leap to the front with a big zinc production. In reality, however, it is not a sudden change. The zinc ore was known and cursed in the old days when the smelters levied a penalty for it and since the modern methods of treating and separating zinc ore have come in vogue, Breckenridge has been getting ready to ship its zinc. It takes a little while, however, to negotiate sales or leases, and to unwater old mines, and even then the best promoters are apt to take up the poorest mines, so it has come about that Breckenridge has only just begun to turn out a considerable tonnage of zinc. The Country Boy claim, belonging to Wm. Lennox, of Colorado Springs, and under lease to the Lanyon Zinc Co., produces about 600 tons per month of the highest grade zinc ore ever received at that company's works from a Colorado mine.

The Moffat road has at last seriously taken up the matter of building the tunnel through the main range, without which this railroad can never be a serious factor in the transcontinental business. The directors are seriously considering the plan of boring a six-mile tunnel, instead of one two miles long. If they decide on the six-mile tunnel it is said the Moffat road will have the best transcontinental grade of them all, not excepting the Union Pacific, which crosses the range where nature made it low and flat.

New York.

Annual Report of the Smelter Trust.—Wall St. Is Disappointed.—Big Operations.—New Plants in Course of Construction.

The annual report of the American Smelting & Refining Co., for the year ended April 30, was rather a disappointment to operators on Wall street. In consequence of the statement, shares were weak and there would have been a bigger drop if the poor showing had not been already largely discounted in a recent decline of both preferred and common stock. As it was, the strong interests behind this enterprise came to the support of the market and it recovered.

According to the statement made, the gross earnings were $11,665,885, an increase of $1,159,202 over the previous year; net earnings, $10,161,358, an increase of $1,262,546; balance available for common dividends, $5,274,054, an increase of $1,155,142. For some weeks there have been hints to the effect that the common stock of the company was to be put on a 10% basis, but as these did not come from the management the latter cannot be held responsible for them. The common aggregates $50,000,000, and now it pays 7% annually, having been put on that basis in October last. Should 10% be paid, it would nearly wipe out the item put to the account of balance after the preferred dividends had been met. However, the statement given out yesterday refers to the condition of the affairs of the corporation over four months ago. Since the beginning of the new fiscal year business has improved and the company has been making more money than ever. In the financial district the opinion was expressed that the 10% dividend on the common stock was still within the probabilities of the near future. Daniel Guggenheim, the president of the company, says in his statement to the stockholders:

In addition to new construction and improvements of a miscellaneous nature made at the various plants during the past year, the following notable additions have been made: Perth Amboy, N. J.; a new copper-refining plant, with a capacity of 75,000,000 lb. annually; Omaha, Neb., new copper-converting plant; Leadville, Colo., increased capacity of lead smelter, equal to 7,500 tons of charge per month; Colorado and Perth Amboy, additional land, giving increased facilities. The valuation of the securities of the company also remains unchanged, while the increase in the investment account represents the value of the company's additional holdings in various subsidiary companies. Although it had been thought the earnings of the American Smelters Securities Co. would not equal its fixed charges during the first year of its existence, for the reason that many of its large properties were still in the development and construction stage, yet the earnings of the Smelters company have exceeded its fixed charges by $500,000; consequently no demand has been made on account of the guarantee by the American Smelters Co. on the series B preferred stock of the American Smelters Securities Co.

The prosperity of the American Smelters Securities Co. is of so great moment to the stockholders of this company that it will doubtless be of interest to note the following, regarding its various properties. In addition to the mining interests of that company, which are operated largely as a base of supply for its various smelting works it had in successful operation at the time of its organization lead smelting and refining works at San Francisco, Everett, Wash., Federal, Ill., and Tacoma, Wash., and also copper smelting and refining works at the latter place.

The Federal company's plant is to be doubled. Additions are to be made to the works at Velardena, Mex., lead and copper smelters are to be built at the latter place, and copper smelters at San Francisco and Garfield. Some of these are nearly completed.

Cripple Creek, Colorado.

New Strike in the Lonaconing.—Good Output From the Gold Sovereign.—The Joe Dandy in a Tangle.—The Victor Still Productive.—Hammer Drills Becoming Popular.—The Drainage Adit.

Carlton & Newcomb, operating a lease on the Lonaconing mine, on Beacon hill, are shipping three cars of fair grade ore per week. This ore is being obtained from a new strike made a few weeks ago at a depth of 280 ft. The lessees, who have been working on this property since the beginning of the year, decided a short time ago to clean up and surrender their lease owing to the lack of pay-ore, but this new strike was disclosed in time to keep the mine in operation. On the Lonaconing dump, Walkes & Bradford, sub-leasing from the above parties, are shipping ore of good grade, a consignment going out last week.——The output of the Mary McKinney mine is around $48,000 for the month of August, the mine having done exceptionally well. During the month forty cars were shipped, having an average grade of $40 per ton.

Owing to the breaking of the crusher of the Ironclad cyanide mill, operations have been temporarily suspended. Another crusher, purchased from the Eagle Ore Co., is being installed, it is of greater capacity than the old one, being able to put through 100 tons of rock in ten hours. Low-grade ore is being shipped to this mill from the War Eagles mine on Bull hill, this being the third consignment of 100 tons to go to that mill. Atherton, Braden & Hill, leasing on the Specimen claim of the Stratton Estate, on Bull hill, are cross-cutting from the bottom of the shaft, which is 150 ft. deep, to cut the big Specimen vein, which has produced so much good ore for the Western Investment Co. and from which this company shipped four cars of ore per week for several months. A distance of 50 ft. is calculated to be sufficient to drive the cross-cut to cut this vein.——The Findley mine has started to ship ore to the new mill erected by the Golden Cycle Co. at Colorado City. The mine has been storing the ore broken for several months, and it is expected that about 100 tons per day will now be shipped

to the mill.——The August production of the Gold Sovereign mine, on the west slope of Bull hill, was approximately 1,100 tons of ore, averaging 1½ oz. gold per ton. This mine ranks among the principal producers of the district. The greater part of the tonnage is contributed by the company and the Harry Diltz lease. A new engine was installed this week, necessitating the suspension of hoisting for a short time.

Work has been suspended on the Joe Dandy property, on Raven hill, pending the disentanglement of the company's financial affairs. The manager, J. M. Wright, has gone to Chicago for this purpose. It is rumored that a mill will be erected on this property in the near future for the treatment of the low-grade ore of the mine.—— Pete Hansen, operating a lease on a portion of the Garfield-Grouse claims of the Stratton Estate, on Bull hill, has struck some good ore; a stringer found near the surface was followed down, developing into an orebody at a depth of 200 ft. The Western Investment Co. is shipping large quantities of ore from the Specimen and Sacramento claims, on Bull hill; the latter claim has been equipped with a new and larger ore-house to facilitate handling the ore from the big Specimen vein. The two claims between them produce a car of ore per day.—— The surface equipment of the Forest Queen mine, on Ironclad hill, is being thoroughly overhauled. New coal bins have been put in and the self-dumper has been put in working order. The shaft is free from water and the property ready for production immediately. This mine is under lease to Chicago parties, Oscar Fogelman looking after their interests.

Very little is now heard of the old famous Victor mine on the eastern slope of Bull hill, but this mine still continues to produce on a small scale through the efforts of lessees. Fred Strong, a nephew of D. H. Moffat, has the entire property under lease. This mine was one of the first in the district to be discovered and was formerly one of the best producers in the camp. A good vein has recently been opened up at a depth of 60 ft. on the Vindicator No. 6 property by Hamor & Co., lessees.

There are no less than four varieties of 'buzzer' drills being sold in this camp at the present time; they are becoming more and more in evidence as time goes by. Stratton's Independence has replaced the 2½ in. drills, in use for several years, by 40 of the hammer or 'buzzer' drills of the Hardsocg variety. It is said, on good authority, that not less than 1,000 more miners will be working in six months than there are now as a result of the invasion of the little drills. Many veins and stopes impossible of operation with the ponderous old-style drills will be worked easily by the use of buzzer, and the small lessee will have twice the show that he now has, either by use of the costly big fellow, or the hand steel.

At a meeting of the directors of the Cripple Creek Drainage & Tunnel Co. on August 30, officers were elected for the ensuing year, contracts between the tunnel company and mine owners were read and formally approved, and executive committee chosen to finance the scheme and supervise the work of construction.

The contract, after reviewing the duties of the tunnel company, in constructing a bore from Gatch Park to the Vindicator shaft, which will cut the mines of the district at an average depth of 2,000 ft., provides for subscriptions to the fund by mine operators. Subscriptions will be made by the purchase of tunnel company's stock at the par value of $1 per share. There are one million shares in the treasury and a minimum of $700,000 must be pledged by November 15 of this year or the contracts are invalidated. The committee will endeavor to secure $800,000 or $850,000 if possible, so as to secure an adequate working fund. As previously stated, nearly $600,000 is assured and the remainder of the money is in sight.

Toronto, Canada.

Gold Discovery in Alberta.—The Silver Nugget of the Nipissing. A Discovery Near Peterborough.—Activity in the Manitou District.—A Find of Silver Ore at Port Arthur.

An important discovery of gold is reported in the Peace River country, Alberta, by the Macdonnell survey party employed in Government work in that region, who have arrived at Edmonton, Alberta, bringing with them many rich samples. The discoveries were made 37 miles below Fort St. John and 17 miles from the British Columbia boundary. The ore is a shale through which are scattered small specks of gold. On the application of crude tests it showed from $7 to $32 per ton, but it is believed that a proper assay will yield even better results. The gold-bearing rock is a bed of shale projecting out of the river bank, and the topographical formation of the country indicates that it is thousands of acres in extent. Seventeen claims have been located along the river bank.

Hydraulic operations at the Nipissing mine, Cobalt, have resulted in the finding of an enormous nugget, said to weigh between 3,000 and 4,000 lb. and to be of almost pure silver—the value being estimated at $25,000. The stock of the company is very active at present and its publicity department well organized.

Mr. Hanson, manager of the West End, Silver Mountain, Badger and Porcupine silver mines in the Port Arthur, Ontario, district, recently acquired by a syndicate of New York and Ohio capitalists, is at Port Arthur engaging a large force of men to work the mines.—— Silver has been discovered by an American prospector on the farm owned by a man named McKniff, about six miles north of Peterborough, Ontario. A sample is reported to have given good returns.

H. W. Scattergood, of Philadelphia, president of the Summit Lake Gold Mining Co., and A. Campbell and A. MacLaren, of Detroit, vice-president and secretary, respectively, have returned from a two weeks' visit to the property comprising 500 acres in the Manitou district of northwestern Ontario. At the company's Little Master mine drifts are being pushed into the orebody, the output—in addition to gold—including a good percentage of galena. The company has appointed Dryden Smith, lately manager of the Laurentian, as general superintendent of the Little Master. The Volcanic Reef mine, adjoining the Little Master, is now under new management, the president of the company being J. V. H. Cook, of Cannonbury, Pa. Richard Jennings, a California mining expert, is making an examination of the property previous to re-commencing operations. The Minnehaha gold mine, owned by the Minnehaha Mining & Smelting Co., of Buffalo, was recently visited by Senator Louis Fechter, president, and other officials, who noted improved conditions as a lower level was reached. The quality of the ore at 75 ft. had improved. The quartz is being tested to enable the company to decide as to putting in machinery to fully develop the property.

Emanuel Wilfong, Joseph T. Montgomery, Henry H. Thompson and Silas S. Parsons have been committed for trial next month on the charge of obtaining $5,000 from Charles W. White, of New York, under false pretences. They sold White claims to two mining properties, having made false affidavits of discovery.

A vein of quartz carrying native silver and copper sulphide was struck by Alex. MacFarlane in the course of blasting operations on Banning street, in the town of Port Arthur, Ontario. The find is regarded as sufficiently rich to offer a chance for profitable working, and claims have been staked. —— Arthur H. W. Cleeve, superintendent of the British Mint, is on his way from London, England, to superintend the installation of machinery a the Mint to be established at Ottawa.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

(Special Correspondence).—At Johnson Camp the Consolidated Mining Co., embracing the Mammoth and Republic group, continues to ship one car of ore per day. About 40 men, of whom 15 are Mexicans, are employed. The Dragoon Mining Co. is shipping about three cars of ore per week. Thirty Mexicans are employed. Mr. Johnson, who recently bonded the Mayflower claim, with no surface showing of ore, after prospecting by open-cuts through wash to solid formation, discovered an orebody. An incline shaft 40 ft. deep shows ore for 23 ft. which averages 8% copper. One car of ore was shipped from this work and further developments and regular shipments will be made as soon as timber arrives to take care of the ground which is unsafe. This is the largest strike made at this depth since the early days of the Peabody. L. Ezekiel is superintendent.——The Empire Copper & Gold Mining Co., owning 12 claims, is working eight Americans.——The Michigan & Arizona Co., operating on the Copper Chief group, is sinking a double-compartment shaft, which is at present 100 ft. deep. It has a good showing of ore in several shafts and inclines and some ore on the dumps. It is expected to encounter ore in the development shaft at a depth of from 300 to 600 ft. Superintendent Robt. Mackay of the Black Prince Co. is pushing development on that property.——The Cochise Copper Co., operating the easterly continuation of the Peabody group, is sinking a shaft on its property. It has attained about 150 ft. depth but is not yet through the wash which covers the formation at this point. There are numerous prospect shafts on this property, but it is said no ore of commercial importance is in sight as yet. K. L. Hart is manager and Leo M. Brown superintendent.

Johnson, Sept. 8.

The new copper smelter at Black Diamond is working smoothly. It has a capacity of 200 tons daily.——E. B. Gage, manager of the Tombstone Con. Mining Co.. says the company has really a bigger undertaking than was calculated upon when operations on the old properties were resumed. But the machinery has proved equal to the undertaking, the water question has been disposed of and daily shipments to the El Paso smelters are made. These will be increased rapidly from now on, as the property can be developed much faster with the larger force.

GRAHAM COUNTY.

(Special Correspondence).—In six months ending March 31, 1906, the Arizona Copper Co. smelted 293,242 tons of first-class and concentrating ore. Of this output, 182,584 tons were obtained from the Longfellow group, 66,704 tons from the Metcalf group and 43,954 tons from the Coronado group, the proportion of first-class and of concentrating ores being 5.91% and 94.09% respectively. The average yield of all ores being 2.4% copper, 41.39 tons of ore were consumed in the production of one ton of copper. On the Liverpool tunnel level of the Humboldt mine, the settling of the ground is not so marked as it was six months ago. A severe side-pressure is still sustained by two stopes working above the adit level. Here the expense for renewal of timbers is very heavy. The ground suffers much from the inflow of rain-water. Arrangements are being made to provide better drainage and also better ventilation, the latter being a good corrective for swelling ground. In the drift running towards the Edinburgh level, an orebody has been cut, which looks like the extension of the Fairplay vein. In the first level of the Humboldt, at a point 450 ft. northwest of the Humboldt shaft, a drift has been extended from the main tunnel for a distance of 135 ft. in low-grade ore. As soon as the drift has been sufficiently extended. the character and extent of the orebody will be determined, The drift will be of use in tapping the northeast end of the Joy mine and in testing the Humboldt mine. West of the main shaft 850 ft., a stope has been opened directly under the Eagle stope and a second stope is being opened in the same ground. The ore is of good grade. On the second level of the Humboldt, the drift is being extended as rapidly as possible to connect with the Yavapai and Joy mines. It is being run in close touch with a promising vein which was barren on the upper levels. This will serve as a base for the cross-cutting of the entire Humboldt claim at points where the ground still stands unbroken. It will serve also to tap a known orebody in the Joy mine which has been neglected because of its inaccessibility. About 1000 ft. southwest of the main shaft a stope is being opened on the main orebody at a point 50 ft. south of the main tunnel. Here the ore has opened out magnificently both in quality and quantity. At the King mine of this same company, the work continues by open-cut and stoping. In the second adit a cross-cut has exposed 12 ft. of sulphide ore at a point 80 ft. below the surface. On the third level work has been extended 200 ft.; beneath stope No. 3 a winze was sunk 70 ft. in good oxide ore, which at this low level changed into sulphide, showing a width of eight feet and carrying 14% copper. The fourth level is the lowest level of the Jamieson mine. It was extended to cut the King vein, which it succeeded in doing lately. Where found, the vein was 18 ft. wide, and carried 5% copper; it has been advanced 150 ft. farther in ore of poorer quality. The 500-ft. level of the Coronado mine of this company at Metcalf has been completed to the air-shaft, and was driven 220 ft. beyond that point. The vein was found to be continuous wherever it was cross-cut, and it averaged 30 ft. wide of pay ore. West of the air-shaft the drift ran into barren ground, just as it did on the 300-ft. level. The West shaft is now down to 700 ft. Copper stains were encountered in the diorite in which the shaft was sunk. The ground is now being cross-cut. The air-shaft was sunk to the same level in good ore to a depth of 650 ft. On the 700-ft. level the ore is 40 ft. wide, but it carries no more than 2% copper. From the main shaft the level has been driven 300 ft. Two cross-cuts have been made; the first, 90 ft. west of the shaft, exposed 48 ft. of ore carrying 2.3% copper; the second, 190 ft. west of shaft, exposed 23 ft. of ore carrying only 2% copper. In the concentrating department of the Arizona Copper Co., taking 180 working days in the half-year, the daily consumption of ore averaged 1,532 tons, as compared with 1,602 tons during the previous six months.

Morenci, September 8.

MOHAVE COUNTY.

W. H. Cushing, president of the Stockton Hill Mining Co., owning the De la Fountaine and Cupel mines, near Stockton Hill, says the mill on the Cupel is almost completed. At De la Fountaine mine a large force of men is at work and in all the openings lead-zinc ore is being developed. In the raises from the adit level big orebodies have been encountered, and in the lower drifts the ore shows improvement. The mine now has 100,000 tons of milling ore blocked out.

CALIFORNIA.

NEVADA COUNTY.

A number of San Francisco capitalists have become interested in the Union Consolidated mine, at Banner Hill, near Nevada City, and in order to finance the concern and pursue development work the company is to be reincorporated under the laws of Arizona. It is said a good body of ore has been found.

The old Blue Union vein was uncovered last Sunday, at a depth of 25 ft., in the bottom of the winze. It was known that the vein was there, and after securing a bond on the property, W. J. Howard, James Gluyas, and E. Dunkley put men at work to clean out the shaft. The vein is 18 in. wide, confirming the statements of old miners who worked in the Belle Union in 1872 when a sudden flow of water drove them out. Samples show gold.

TUOLUMNE COUNTY.

R. E. Dull recently took out a pocket of $2,400 from his mine on Jackass hill, near Tuttletown.——The Crystalline group of mines, a mile northwest of Jamestown, has been bonded by C. E. Shafer to J. L. Chaddock, of San Jose, and W. H. Stenger, of Beaumont, Tex., who, under the management of C. W. Ayers, intend to develop the mine at a greater depth. The Crystalline is the second mine south of Table mountain, the first being the Alabama.

KERN COUNTY.

(Special Correspondence).—A. C. Bercham is developing a valuable property in the Phœnix mine, near Johannesburg. The mine was operated several years ago, but was not particularly successful, the vein being small and of irregular value. A new inclined shaft was sunk 200 ft. by Mr. Bercham, and levels opened at 100 and 200 ft. Driving easterly the ore has been found to be of better grade and has increased in amount, until, in places, there are from 4 to 12 ft. of payable ore. The vein has split, and toward the most easterly end there is 15 to 20 ft. of solid ore of good grade, with every geological indication of a further increase in amount of ore. The surface equipment consists of hoist, 5-stamp mill, with space and power for additional stamps. There is also a cyanide plant on the property. A compressor and additional stamps will be added to the plant.

Randsburg, September 8.

COLORADO.

GILPIN COUNTY.

(Special Correspondence).—The Running Lode mine, being operated by the Gower Syndicate, is reported ordered closed down by the stockholders. This mine has been one of the famous producers of the district. Dr. Gower organized a company several years ago and took active management of the property. For a time everything went well—as long as the ore lasted, but when that gave out the stockholders refused to come forward with money to seek another ore-shoot. A little work is being done at present, but it is understood will cease shortly. The Doctor has forsaken mining and gone back to his profession, as a teacher of music. At one time the stock sold as high as $15 per share, but now there seems to be no demand at any price. A one-time stockholder in the concern stated that the property was run on an economical basis, so much so that the management did not like to pay good wages for good men, nor would it spend a dollar to develop the property. A story is told of the superintendent, who stated that he had been on the property for eight years, and never spent over $25 in that time for assays on the mine. Of course when a carload of ore was shipped to the smelters they had a control which was not included in the $25.

Black Hawk, Sept. 5.

SUMMIT COUNTY.

(Special Correspondence).—The increased activity of the camp of Breckenridge has, as yet, shown no signs of abatement, but new enterprises are starting up and many new discoveries being made.——George Hammerschlag, an old-time prospector and miner who has operated on Farncomb Hill for many years, struck a six-foot body of high-grade gold ore in the Wilson property which adjoins the Wire Patch. Free gold is seen and some nice cabinet specimens have been obtained.——King and Hammel, who have a sub-lease on the Bullion-King property, have opened up a surface vein of rich lead carbonate over 18 in. wide.——The management of the Old Union Co. intends to install a dynamo for lighting their mill and the main levels of the mine.——The North American Placer ground, owned by the American Dredging Co., on Swan river, has been taken under bond and lease by Ben. Stanley Revett. Three churn-drills are now employed, sinking test holes to bedrock and when the richest channel has been found the Bucyrus dredge will be put to work.——The Reliance Dredging Co.'s big dredger on French creek continues to wash large quantities of gravel and is making good clean-ups.——At Swandyke camp much more work is going on this year than heretofore, generally. Ed Graw & Co. shipped 30 sacks of high-grade gold ore from a prospect and got returns of over $300 per sack.——E. E. Young, manager of the Hoosier Creek Mining Co., has arrived at the mine and intends to resume sinking the main shaft. He expects to cut the vein, which was four feet wide at the 100-ft. level, by running a 50-ft. crosscut from the 200-ft. level.——The Wilfley mine at Kokomo is having a new calcining furnace built in connection with its reduction works. It has been found that by roasting the concentrate from the Wilfley tables previous to treatment by the Magnetic separator, much cleaner and higher grade products can be obtained.——Montezuma camp is booming. This district produces much shipping ore of high grade and with the installation of suitable mills would also produce a large amount of good lead and zinc concentrate.——Over 60 new locations have been made in the Horse Shoe district above Rathbone in the last 30 days.——The Lenawee Tunnel Co. has its new mill running on ore from the Fisherman mine, which it now holds under lease. The Fisherman has been a shipper of high-grade lead and zinc ores for many years and has in its main workings large quantities of mill ore, which assays 20% each of zinc, lead and iron and carries 8 to 10 oz. silver and $6 gold per ton.——The extension of railroad communication from Denver to Argentine by the opening of the Wilcox Electric railroad has a tendency to open new territory on Argentine Pass.——The Waterloo mine is again in operation and a 10-ft. vein of zinc ore carrying lead and silver has been opened.——On Glacier mountain Bull & Rosengarten are driving an adit on the northern slope, which is now in over 300 ft. and contains a vein 18 in. to 2 ft. in width that assays 50% zinc. This property is expected to ship regularly from this time on.——The Rothschild tunnel is being steadily pushed ahead with machine-drills. It is now in over 3,600 ft., and has cut a vein of ruby silver at a depth of 2,400 ft. below the surface. Some of this ore assayed 19,000 oz. silver per ton.——Charles Campbell is operating the Clarion under bond and lease and is taking out ore which is high in lead and carried 400 to 500 oz. silver per ton.——The Braganza mine on Collier mountain has shipped a carload of quartz carrying yellow copper and running high in gold and silver.——The Pennsylvania mine is keeping up a steady production of shipping ore and concentrate which are loaded on the railroad at Keystone and shipped to Leadville and Denver via Breckenridge.

Breckenridge, September 8.

IDAHO.

SHOSHONE COUNTY.

The Nine Mile Co. will resume work on its property near Wallace. This decision has been hastened by the discovery of ore on the surface by O. H. Linn, superintendent of the Success Co., who is also manager of the Nine Mile Co. Work for the present will be confined to sinking a shaft on the vein. Extensive development has already been done in three adits which have not, however, reached that part of the vein where the new discovery was made.——The Samson Mining & Development Co. has let contracts for more development on its property on Big creek. W. J. Herring has taken the contract. The company expects to tap its main ore-shoot with this work. Rich copper and silver ore has been taken from the main adit which will now follow the main vein directly for the ore-shoot. The property has about 400 ft. of development. Work on the long adit of the Silver King mine, by which the ore-shoot of the Stewart will be tapped, has begun on a large scale, and Fred O. Merriam, the manager, has taken his residence at Kellogg to personally direct the work. The Stewart, Silver King and Crown Point properties were recently bought by F. Agustus Heinze.

MONTANA.

GRANITE COUNTY.

George H. Savage, manager of the Milwaukee Gold Extraction Co., in Red Lion district, has purchased a gasoline hoist for the Hannah mine. The directors of the company some time ago decided to sink a shaft to explore the Hannah to a depth of 600 ft. below the present workings, where it is believed that copper ore will be found. It is thought that the iron cap of a great vein covers a copper deposit. The shaft has reached a depth where hoisting machinery is necessary. Owing to the difficulty of supplying water for steam boilers near the top of the mountain, a gasoline hoist was decided upon. The ore now being treated at the company's mill, near the foot of the mountain, is being mined from an adit which taps the Hannah vein at a depth of 125 ft.——James M. Glenn, of Cincinnati, Ohio, has been for two weeks at his mine near Georgetown, and now has men developing the Orphan Boy and adjacent claims. He has opened up ore running from $6 to $20 per ton, and will start his mill for a test run on this ore.

MISSOULA COUNTY.

I. M. Cuschner, president, and William Dee, manager, recently visited the big Missouri Mining & Milling Co.'s property, one-half mile from Eddy, and 170 miles from Spokane, on the Northern Pacific. The company has 160 acres of placer ground on the banks of the Clarks Fork river. Miners are starting a cross-cut adit to cut the vein at 1,200 ft. depth. Vein No. 2 will be developed by a cross-cut from vein No. 1. The company will lay in provisions and supplies at once to last the full crew until May. The veins carry gold and silver.

NEVADA.

ESMERALDA COUNTY.

Every producing mine and every producing lease in the Goldfield district is closed down, according to press despatches, as a result of the meeting held by the miners on September 10, at which they decided to support the Industrial Workers of the World, an organization of unskilled laborers that seeks to dominate the labor situation here. The holders of leases who have closed down have the assurance of the mine owners that their time will be extended for as many days as they are now closed down. The Industrial Workers of the World began the present trouble by boycotting a local paper and threatening to boycott everybody who patronized or advertized in it. On the night before the Gans-Nelson fight an employee of the paper was forcibly taken out of town and left on the desert, with orders to keep going. Prominent mine owners went after the man and brought him back. The mine owners expected the trouble would end yesterday, when 12,000 miners met at the fight arena to decide whether their organization would continue to support the I. W. W. The mine owners thought their employees would repudiate the organization, but the miners voted to stick to their original stand. Feeling is intense, but it is believed that calm counsel will prevail and that the trouble will soon be straightened out.—The books of the Miners' Union at Goldfield show that of the 2,000 workmen in the district, 1,400 are on the day shift. The payroll is about $300,000 per month. There are more men at Goldfield now than at any other period in its history.

LINCOLN COUNTY.

(Special Correspondence). — With the advent of cool weather, many men are coming into Searchlight. New companies are preparing for extensive development work upon their properties, and several of the older companies that reduced their working force during the summer are now operating with three shifts and an increased force.—— The Duplex Extension Mining Co. is to let contracts to sink a double-compartment shaft to water level on the Regal claim. The vein can be traced from the Duplex mine, and the surface showing is promising. George McClintock, of the Searchlight Bank & Trust Co., has been added to the directorate of the Duplex Co. —— A merchants' association was organized in Searchlight during the past week, to improve the commercial conditions of the camp. One of the first matters taken up was the installation of a water system for fire protection. A 50,000-gal. tank will be erected upon Granite hill overlooking the camp; mains will be laid along the principal streets and hydrants placed at short intervals. ——The management of the Cyrus Noble Mining Co. has inaugurated a new system of treating the ore. Heretofore the returns from the mill have not been satisfactory. Concentrators will now be added to the mill equipment. —— The Searchlight Vanina Mining Co. is prospecting its Dorothy group and will sink a working shaft. The property is situated west of the Searchlight Mining & Milling Co.'s mines. Development work will be under the supervision of John Howe, who has charge of the Searchlight copper-gold mine, on Copper mountain. —— H. B. Adsit, manager of the Colorado Mining & Milling Co., reports having struck a large body of oxidized ore at a depth of 74 ft. in the shaft on the Grey Ghost claim, which is being sunk to water level. The orebody encountered does not outcrop on the surface. —— The Stone-Brown Co. has acquired the Gold Sovereign group adjoining the east end lines of of the Southern Nevada Co. The property was bonded from the original locators. The conditions of the bond call for extensive development work within one year. There is a large vein in a contact running east-west on the Gold Sovereign claim. —— The Southern Nevada's Hi Hu vein strikes diagonally across the Camp Bird claim, and the Euclid vein can be traced into the Annette. A three-foot vein of copper-stained quartz carrying a narrow streak of high-grade ore traverses the Gold Link claim, and the first shaft will be sunk on this vein.

Searchlight, September 8.

NEW MEXICO.

Regarding mining conditions throughout New Mexico, T. A. Jones, in the Santa Fe *New Mexican*, says that the Carpenter district in Sierra county is again producing zinc and lead, and the Magdalena district is among the big zinc producers of the country. Tres Hermanos district, 25 miles south of Deming, shows considerable development in zinc properties recently found. There is renewed life near Estey City, in the southeastern part of the Oscura mountains. In the San Andres mountains copper properties are being developed by Eastern capitalists, who are making a good showing. These are in Socorro county. The Lordsburg mining district is shipping from three to five carloads of ore per week. The ore of the Lordsburg district is mostly silicious and heretofore has been costly of treatment. Freight rates on this class of ore to the Douglas and El Paso smelters have been reduced, which has enabled mine owners to get to these smelters with their ore and receive higher net returns.

OREGON.

BAKER COUNTY.

Wood & Wandersee have a shaft down 70 ft. on a quartz claim near Sumpter. It is reported that good gold ore has been found there in a cross-cut ——W. H Heath, the superintendent of the Standard mine at Quartzburg, contemplates some changes in the mill at that property.

SOUTH DAKOTA.

LAWRENCE COUNTY.

In the neighborhood of 50 carloads of ore are hauled daily from the Bald Mountain district to the mills at and near Deadwood, and this quantity will be increased by a new night train. This ore is from Terry and Portland, from 20 to 24 carloads per day coming from the former, and from 20 to 26 carloads from Portland.

PENNINGTON COUNTY.

A. C. Baxter, of Lima, Ohio, one of the principal stockholders in the Dakota-Calumet Copper Mining Co., says the Dakota-Calumet has installed a new power plant with increased capacity. Formerly the company had but 300 h.p., but has added 200 more by the installation of a large boiler. A centrifugal pump to handle the sediment, and a station pump were added to the equipment. Work is being carried on below the 300-ft. level. A. C. Overpeck is manager. The Dakota-Calumet adjoins the Blue Lead Copper property, near Sheridan.

UTAH.

BEAVER COUNTY.

Reports from the Cactus properties of Samuel Newhouse are to the effect that there has been material improvement both in mine and mill, during the past summer. The mill has been running for more than a year, and the percentage of extraction has been steadily increased, until there remains little to be desired. The mill is treating from 850 to 900 tons of ore per day, and the saving is between 80 and 85%. Under the superintendency of C. D. Moffatt the mill is in excellent condition, the concentrate being shipped to the smelters of the American Smelting & Refining Co. at Salt Lake. The concentrate is running 15% copper, in addition to gold and silver.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence). — The Oversight Mining & Milling Co. has made a discovery of gold-bearing quartz at the base of Missouri mountain, about 700 ft. west of its No. 2 adit. Samples of the ore taken from four places assayed respectively $12, $25, $60 and $61. This ore differs from any other ever found on the Oversight group. It carries little iron and contains cobalt in commercial quantity, in addition

to the gold.——Members of the Belcher Co. recently visited the Belcher mine. The president reported that the No. 4 adit, the last started, is running on the vein and will be under the workings of the No. 3 in about 500 ft. He also says the Belcher mine will begin shipping ore as soon as the Belcher mountain railway finishes the laying of rails. The company has decided to construct a gravity tramway from the upper adit to the ore-bins below, a distance of 2,200 ft. While the Belcher has a large vein, no stopes have yet been opened, and the small force employed indicates that little preparation is being made for stoping.

Republic, September 8.

SPOKANE COUNTY.

The fight between the Inland Empire Co. and the Consolidated Smelting Co. for a right-of-way out of Spokane down the river has disclosed the fact that the latter company has purchased the right-of-way and plant of the old smelter company, which built but never operated a smelter seven miles down the river from Spokane. This was built many years ago, and at one time Robert G. Ingersoll was chief stockholder. It seems the Consolidated Smelter Co. has now acquired the property, and proposes to rebuild and operate the plant. Philadelphia and Grand Rapids people are largely interested. The Graves people are trying to condemn a right-of-way over the same route.

STEVENS COUNTY.

(Special Correspondence). — The Metaline district continues active and much work is being done. The Stirling Silver-Lead Co. is constructing a ditch to take water out of Sweet creek and develop about 2,000 h.p. with a 250-ft. head. The Larsen Lead Co. is expecting to use this power at its concentrator, for which the ground is being broken. The latter has taken an option on the Roi Clark claims, at the mouth of Flume creek, on the west side of the Pen d'Orielle river, and is employing 12 men in prospecting and putting up buildings for a camp. —— The Metaline Mining & Smelting Co. is employing six men underground. —— A five-foot vein of silver-lead ore has been opened by an 80-ft. adit on the Bella May mine, and 30 tons of ore have been shipped up to the present time.

Colville, September 8.

WHITMAN COUNTY.

The Hecla Copper Mining Co. has been incorporated by J. C. Northrup, C. E. Frederick, D. G. Klinefelter, W. F. Chalenor, G. N. Lamphere and W. R. Belvail, of Palouse. The company is formed to develop the Hecla group of claims in the Hoodoo mining district, 35 miles east of Palouse. Since the advent of shipping facilities, furnished by the Washington, Idaho & Montana railroad, the Hoodoo mining camp has taken on new life. There are now 40 men at work there.

CANADA.

BRITISH COLUMBIA.

The Hall Mining and Smelting Co., Ltd., states that owing to increase in the shipments of ore, and the shortage of labor, it is behind with the unloading of ore, and for some time past has been under expense for demurrage. A few days will be required to make some changes in the sample mill, which will increase its capacity, and the company therefore asks shippers to defer making further shipments for a time. For the past five weeks the Nelson smelter has undertaken to handle the whole output of the St. Eugene mine to enable the Trail smelter to make some alterations.

The output of ore from the Boundary mines for the week ending September 8 was as follows: At Phœnix, Granby mines, 13,932 tons; Snowshoe mine, 870 tons; Brooklyn-Stemwinder mine, of the Dominion Copper Co., 2,211 tons; Idaho mine, 330 tons; Rawhide mine, 792 tons; Sunset mine, at Deadwood, 729 tons; Mountain Rose, at Summit, 40 tons; Oro Denoro, at Summit, 231 tons. Total for week, 19,135 tons. Smelter treatment during the same period: Granby Co., 16,320 tons; Dominion Copper Co., 4,102 tons. Total, 20,422 tons.

YUKON.

There is good reason to believe that the amount of gold brought down to Seattle from the Klondike district will greatly increase during the next few years. At present dredging is the most prominent feature of mining on the Klondike, and there are six gold dredges in operation in the district. The next season will witness a fleet of a dozen dredges in operation on the Bonanza, Klondike and Forty-Mile streams, provided American manufacturers can supply the demand for this class of heavy machinery. The gold output will be correspondingly increased. It is to the credit of the Canadian Government that during the years succeeding the Klondike rush they have expended close on $1,500,000 for the construction of roads and trails, and more than $75,000 for the improvement of the Yukon river and its tributaries. There are many Americans in the Territory, and the Canadians seem glad to have their cousins from below the boundary line to assist them in developing the great resources of that vast territory.

MEXICO.

CHIHUAHUA.

The Mary Mining Co., of Pittsburg, is opening up three *antiguas*, or abandoned mines, at Tojiachic, in western Chihuahua. The ore is high grade and suitable for smelting, so that a smelter is to be built shortly. Dr. Leandro Routh is local manager. —— A company organized by Bernardo Garcia, the promotor of Lluvia de Oro, has taken over the Cocineros, Concepcion, San Joaquin and Natividad mines in the Santa Eulalia district, the Donato Gueria mine at Parral, and the Independencia group at Santa Lucia. The organization is made of local people and the properties are considered promising.

GUANAJUATO.

The Guanajuato Reduction & Mines Co. is now treating 250 tons of dump ore daily. A tube-mill for re-grinding the ore has been placed in operation. The unwatering of the old mines of the Valenciana group is in progress, and as the water is lowered better grade ore is found. The milling of the lower grade dump ore will be soon discontinued in order to allow the handling of the richer ore from the mines. The Peregrina Mining & Milling Co. is rushing work on its 100-stamp mill in this district. It is expected to have 40 stamps dropping within a few days, and the remaining 60 stamps will be ready for operation early in September.

M. E. and Bernard MacDonald, the well-known mining men of this district, have organized the Mines Selection Co. with the object of securing developed Mexican properties and turning them over to other interests. The company will not confine its operations to any particular district or districts, but will handle developed properties in all parts of the Republic. The MacDonald brothers last year arranged the sale of the famous Real del Monte mines in the Pachuca district to the United States Smelting, Refining & Mining Co., of Boston. They are generally understood to be the parties who recently secured an option on La Blanca mines in the Pachuca district for $12,500,000. It is believed that La Blanca mines will be also taken over by the United States Smelting, Refining & Mining Company.

JALISCO.

W. M. Mathews, general manager of the Santa Domingo mines in the Hostotipaquillo district of Jalisco, states that the Santa Clara tunnel had cut the vein, exposing ore rich in silver sulphides and native silver. The work of driving the tunnel has been in progress for several months, the vein being cut at 140 ft. A shaft on this property has shown ore running from $100 to $150 per ton. The San Domingo Mining Co., of St. Louis, which owns the mines, has increased the working force under the direction of Mr. Mathews to 75 men, and has raised the appropriation for development work to $1,500 monthly. Six adits are now being driven. The Santa Clara is one of the number, and the others are the Guadalupe, El Mono, Trinidad, Esperanza and San Pedro.

SONORA.

Las Chispas mine is in a healthy condition. Development work has reached the 800-ft. level and rich ore is being broken. The best of it is sent to the smelter at El Paso and the low grade is treated in a 10-stamp mill. Monthly returns are said to average $500,000 Mexican. The product is chiefly silver, with some gold. The mine is 14 miles southeast of Arispe and the property covers 500 acres. The sole owner lives in Switzerland.

Personal.

S. S. SORENSEN is at Oakland.

THOS. H. LEGGETT is in Siberia.

J. E. SPURR is at Velardena, Mexico.

A. J. CLARK has returned to Denver from Los Angeles.

GILBERT J. ROOTE is at 1260 O'Farrell St., San Francisco.

LESTER JACKSON has returned to Prescott, from Mexico.

E. J. MCCAUSTLAND has returned to New York from Europe.

A. B. WALLACE is in charge of an assay office at Seoul, Korea.

OWEN JOHNSON was married at Victor, Colorado, on August 22.

WALTER P. JENNEY'S address is now Box 696, Tonopah, Nevada.

W. R. FELDTMANN has returned to London from Western Australia.

LESTER W. STRAUSS is on his way from New York to Lima, Peru.

W. J. BELCHER is investigating mining property at Goldfield, Nevada.

WILLIAM BAILEY has returned to Los Angeles from a trip to Europe.

THOS. RICKARD, of London, has returned from a visit to St. Petersburg.

DENNY BROS. have opened an office at 564 Salisbury House, London.

W. F. CALVERT is examining dredging ground on the Unuk river, Alaska.

W. H. HEATH, of Baker City, Ore., has gone to Denver on mining business.

WM. A. HEWITT has returned to San Francisco from an extensive Eastern trip.

JOHN S. JONES has returned to Prescott, Ariz., from an extended Eastern tour.

E. G. DENNISTON, of San Francisco, has gone to Chicago and will visit New York.

WALTER G. PERKINS has returned to Ely, Nevada, from a visit to Salt Lake City.

WALTER P. JENNEY has changed his address to P. O. Box 696, Tonopah, Nevada.

CHARLES C. JONES has returned to Los Angeles from Panamint district, California.

C. D. EMMONS has returned to Seattle from examining mines on Queen Charlotte Island.

F. P. SHERWOOD is manager of the Guadalupe Mining Co. at Inde, in Durango, Mexico.

PETER T. AUSTEN, of New York, is re-modeling the Rigby reduction works at Mayer, Arizona.

ROBERT H. RICHARDS, on his Western trip, made professional visits in Colorado and Missouri.

DONALD F. CAMPBELL, who is with the Mountain Copper Co., is on a visit to San Francisco.

HORACE J. STEVENS has recovered from illness and is at work on his annual handbook on copper.

J. SULLIVAN. has taken the position of foreman at the Soulsby mine, at Soulsbyville, California.

CHARLES D. AKERS is superintendent of the Happy Hollow mine near Downieville, California.

J. D. WOOD, of Salt Lake, has been appointed manager of the Thompson mine at Park City, Utah.

C. M. FULLER has returned to Denver from a trip through Georgia, Alabama, and other southern States.

W. C. HOWARD has returned to Los Angeles from his mines on the Colorado river, near Gold Roads.

FAYETTE A. JONES, of Albuquerque, New Mexico, is examining the placer beds near Cerrillos, New Mexico.

CHARLES E. HALL, of Mexico City, has been examining the Santo Domingo mine in the Etzatlan district of Jalisco.

Books Received.

DICTIONARY OF ENGINEERING TERMS in English and Spanish by Andres J. R. V. Garcia. This is a handy little book of 150 pages giving 3,000 technical terms in English and Spanish, to which is added a serviceable index in both languages. Mining engineers and operators in Mexico and South America will find the book a useful eompanion. Published by Spoon & Chamberlain, New York, and for sale at one dollar by the MINING AND SCIENTIFIC PRESS.

MICA AND THE MICA INDUSTRY by George Wetmore Colles. This is a monograph originally published in the *Journal of the Franklin Institute* and subsequently revised and enlarged by the author. It is a neat little book of 130 pages and affords a discriminating compilation of all the latest information on mica, including the mineralogy and geology of the mineral, the geographical distribution, mining and milling, its uses and statistics. Owing to the increased use of mica, this volume should prove valuable to engineers and to manufacturers. Published by the Frank lin Institute, Philadelphia, and for sale at $2 by the MINING AND SCIENTIFIC PRESS.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, September 12.

Con. Virginia	$0.81	Manhattan Con	$0.84
Ophir	2.85	Jumping Jack	0.51
Savage	0.91	Midway	2.23
Tonopah Ex	5.25	Montana	2.90
Belmont	4.65	Mohawk	3.25
Jim Butler	1.35	Silver Pick	0.58
Jumbo	1.15	Sandstorm	0.63

ANGLO-AMERICAN SHARES.

Cabled from London.

	September 6. £ s. d.	September 13. £ s. d.
Camp Bird	1 7 6	1 6 3
El Oro	1 10 6	1 9 0
Esperanza	3 3 9	2 18 9
Dolores	1 11 3	1 13 9
Oroville Dredging	0 18 9	0 19 0
Stratton's Independence	0 4 0	0 4 3
Tomboy	1 4 4½	1 6 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for Week Ending September 6.	Average Prices for Week Ending September 13.
Copper—Lake (cents per lb)	18.825	18.80@19.05
" Electrolytic "	18¼@18 11/16	18.65@18.85
" Casting "	18¼@18⅜	18½@18⅝
Lead "	5.75	5.75
Spelter "	6.05	6.10@6.15
Silver (cents per oz.)	67⅜	68¼

CURB QUOTATIONS—NEW YORK.

	Prices for August 30.	Prices for Sept. 13.
Bingham Central	2¼	1½
Boston Copper	29¼	29⅜
Calumet & Arizona	16½	16½
Cumberland Ely	9⅛	9⅜
Dolores	7½	8⅜
El Rayo	5	5½
Guanajuato Con	5⅜	5¼
Giroux Con	7	6⅞
Greene Con	24⅞	25¼
Nevada Con	18¼	17⅞
Nipissing	7	9⅝
Tennessee Copper	45	43¾
Tonopah Ex	5⅝	5¼
Tonopah-Belmont	4.90	4.90
Tonopah	18¾	18¾
United Copper	62⅞	63⅜
Utah Copper	29	27⅝

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

THE CALIFORNIA DEBRIS COMMISSION HAVING received applications to mine by hydraulic process from Lost Channel Mining Co., in Lost Channel Mining Co.'s Claims, near Cromberg, Plumas County, Cal., draining into Jackson Creek; and from J. S. Goodwin, in Nevada Mine, near You Bet, Nevada County, Cal., draining into Greenhorn Creek, gives notice that a meeting to receive any protests will be held at No. 1733 Pine St., San Francisco, Cal., October 1, 1906, at 1:30 P. M.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

WHEN pump valve-seats are badly worn a disc of sole-leather clamped to the hard rubber valve is often of service.

THE failure to cross-cut the country on either side of a vein has caused many an otherwise competent miner to overlook a good orebody.

IT IS often the case that streaks of ore occur within a vein, crossing it or lying in such a position as to suggest their secondary origin. Such ore may be wholly unlike the main mass, and is often much richer.

CHROMIC IRON, pyrite, magnesite and manganese oxide are all salable in California, but to be commercially valuable these minerals must occur in a situation easily accessible to cheap transportation to the markets.

THE strongest exploders for dynamite always produce the best results, for the reason that they effect a more instantaneous and complete explosion of the nitroglycerine in the powder, breaking more rock and creating less gas than when the lower grade exploders are used.

ANY sandstone, or other building stone, containing much pyrite will not prove to be durable, as oxidation of the pyrite will in all probability result in at least a partial disintegration of the stone. Stratified building stone should always be laid in the wall with its bedding parallel to the horizon, and never set on edge, where the stone is required to sustain much weight.

THE use of steam-shovels would be justified in many places where they are not employed. The cost of operating a steam-shovel can be readily ascertained. It then becomes a question of comparison with other methods of handling rock, whether it be waste or ore. It should be remarked, however, that the steam-shovel is seldom economical in a small operation.

IN making comparisons of various mines, not only the amount and value of the ore available must be considered, but also the environment of the mines under consideration, for an orebody of given dimensions and value per ton may pay handsomely in one locality, where a similar ore elsewhere may be commercially valueless, owing to disadvantageous situation.

THE ore in a caved stope may often be recovered by one means or another. In some instances it may be drawn directly from the caved ground by first excavating an approach for chutes and working place in the solid country rock adjoining the cave; in other cases the ore may be allowed to run down into a stope opened below, the waste ore being separated, at some convenient place, should this be necessary or advisable.

IT IS generally considered unsafe to accept the proffered aid of the owners of a mine, or of those in any way connected with the sellers. The cautious engineer usually takes his own men with him, and insists on doing his work in his own way unaided by strangers. Such conduct on the part of the examining engineer may give offense to the other party, but it is generally acknowledged the safer plan to refuse all unsolicited aid.

AT the last special session of the California Legislature the measure which provided that assessment work on unpatented mining claims be not required for the period of one year on account of the loss to the mining interest occasioned by the San Francisco fire, and which was adopted by both houses and forwarded to Congress, failed to receive a hearing in that body. All claim owners will be required to do their $100 worth of assessment work as usual.

IN deposits of copper-bearing ore, there is often little or no indication of the presence of this metal in the outcrop. The Peacock mine, in the Lava Beds district, San Bernardino county, Cal., is an instance. The outcrop is highly silicious, iron-stained, and carries from 10 to 80 oz. silver per ton, while barely a trace of copper can be seen. In depth, however, bornite with 15 oz. silver per ton, was found to be the prevailing ore, and the property was worked for its copper rather than for the silver.

LIGHT TIMBERS may be used in square-sets, where the ground stands well for a time, if filling is promptly placed as stoping progresses, but it must be remembered that a rock stope only partly filled affords support to the walls, or superincumbent ore, only where actually in contact with the overhanging rock mass. The mistake most commonly made is that of attempting to extract ore from too large a superficial area. Stopes in large veins should be carried upward in the form of a pyramid, relatively high and narrow, and not broad and flat. If the vein be very wide—more than 100 ft.—it is usually the best practice to carry the stopes in comparatively narrow section longitudinally of the vein and extending from wall to wall.

TO MAKE a matte direct from copper ore, the latter should contain 15 to 16% sulphur. With a 4% copper ore, it would certainly be best to concentrate — if the ore is amenable to such treatment — then roast the concentrate, leaving about 8% sulphur in it, and then melt it down in a reverberatory with gas fuel. The use of wood as fuel for smelting is practicable, but wasteful. It would be better to make fuel gas and apply the latter direct to the matting furnace. Local conditions and the composition of the ore will determine the best course of action. In any event, before going to the expense of a smelter or a concentrator, or both, it is the part of wisdom to get expert advice, both in the choice of a process and in the erection of the plant.

CALCIUM OXIDE (quick-lime), in suitable amount, 5 to 10 lb. per ton of ore, is often employed in silver mills, to counteract the influence of manganese-oxide. The Calico ore probably contains the black oxide of manganese, and not 'magnesium,' as stated by our correspondent. It is very difficult to avoid loss of mercury where treating ore containing manganese oxide. Where lead and zinc sulphide are obtainable, it is good practice to mix the manganese-bearing ore and the sulphide ore, treating them together. When manganese oxide is present the bullion produced is generally finer (higher grade), than where there is no manganese in the ore. It is probable that the treatment of manganiferous ore in pans releases oxygen from the manganese which it is thought results in the formation of a suboxide of mercury. It might be worth while to endeavor to recover some of the mercury by discharging the tailings into conical hydraulic-classifiers, conducting the slime to a tank and allowing it a long time to settle. It is not uncommon to find considerable mercury at the bottom of the settling-boxes beneath vanning machines which contain only the finest slime floating from the washing box, consequently these globules of quicksilver must represent the accumulation of floured quick.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Vein Mining in Alaska.

The Editor:

Sir—I note with pleasure the attention which my communication in the issue of May 12 regarding 'Vein Mining in Alaska' has received by so competent an authority as Mr. William M. Brewer. I am especially grateful to Mr. Brewer for enumerating several of the metalliferous lode properties now coming into prominence in the South Coast Province, concerning which he has had opportunity to acquire recent information. My previous letter was rather in the nature of an enquiry for the facts than an attempt to decry the unquestionably large mineral resources of Alaska.

I have followed with no small degree of interest the development of quartz-mining in Alaska since the year 1895, when it was my privilege to visit the mines of Silver Bow Basin, Berner's Bay, Sheep Creek Basin, and other points of the Alexander Archipelago. In 1904 when I again made an inspection of Silver Bow Basin, matters had not progressed to any considerable extent in the way of lode mining. Two small mills were operating, and there was the same talk of great prospective developments in the region round about, that I had heard nine years before. The wide belts of stringer-leads in the black slate have always offered the suggestion that large low-grade orebodies might sometime be developed. The Alaska-Perseverance will probably provide ore for its 100-stamp mill from this character of material. The continuous and profitable operation of so large a mill in Silver Bow Basin will be a source of gratification to those interested in Alaskan development.

Perhaps a more just criticism of my paper than that of the pessimism charged by Mr. Brewer, would be, in the case of the Prince of Wales copper deposits failure to note the increase of production during the present year. I should be very glad to be kept informed of the progress made in that region by means of the mining press. No recent data excepting those given by Mr. Brewer have come under my eye.

So far as unfavorable conditions for prospecting are concerned, I tried to make due allowance for such in referring to the Alexander Archipelago and adjacent portions of the mainland. It is not easy to find rock exposures in that part of the country. The islands may, however, be circumnavigated in small boats at certain times of the year without great personal risk. As for the country farther west, numerous prospectors make a practice of exploring the coast in dories. I have personal knowledge that the whole south shore of the Alaska Peninsula from Cape Douglas has been so prospected. In 1895 I formed one of a party that cruised these waters for some 600 miles in a 40-ft. tug-boat, and spent one whole day contending with the tide-rips of Turnagain Arm in a sea-otter boat, and there was no serious danger or discomfort attendant on our movements.

In regard to the personnel of the Alaska prospector, he comes from many places. One of the best prospectors I have ever known was born on the Massachusetts coast; another was formerly a fisherman in the Bay of Naples. But from whatever interior community he may hail, average judgment and intelligence should teach him to andle a boat after a brief period of tuition.

There is every indication that the Copper River copper deposits will in due time produce considerably. And I should perhaps further emphasize my previous statements regarding the McKinley range. This range is high and difficult of access. Along and adjacent to a line 100 miles to the north-northeast, and 200 miles to the south-southwest, of Mount McKinley, ore deposits, principally valuable for gold and copper, should be found. In a parallel direction and following the head of the Chulitna, tributary to the Kuskokwim, I believe that extensive deposits of lead ore with values in silver and lead occur, but whether of marketable worth or not it is impossible to say.

C. W. PURINGTON.

Denver, Colo., August 23, 1906.

Who Is a Mining Engineer?

The Editor:

Sir—Speaking of 'Mining Quacks,' whom 'Viator' castigates so forcibly in the issue of August 4, brings us dangerously within the range of the old proverb, that people who live in glass houses should not throw stones.

There are two points prominent in the college man's career.

First, for the years spent in acquiring instruction and training at the school, he pays out his own money. This is but the beginning of the education.

Second, after he leaves college, the investing public gives him the opportunity to acquire practical training at its expense. The right therefore to judge of the fitness of the subject, to have the legalized ownership of the title 'Mining Engineer,' with its honors and emoluments should lie with the investing public. The difference between the profit and loss on operations, conducted by the subject, to the credit of the latter, should constitute the examination necessary to prove fitness. If failures are made, they should be judged by the amount of work done for the funds expended in a judicious manner. The findings, if it can be proved that the failure was the result of no fault on the part of the subject, should go to his credit. In conducting an examination of this nature, the practical mining man, with no technical training, should be entitled to recognition, according to results achieved, with the same rights as the college man receives.

I live in a district where 90% of the failures recorded in mining can be laid at the door of the college man. Undoubtedly in other mining camps the same showing is made. Measured by the above plan of examination, there will be numerous gaps in the profession. It would be well-nigh impossible to say who are quacks or who are not. Mining is a dollars and cents proposition, in which it differs from the practice of medicine. That is a life and death proposition, and we have not got to the stage of perfection in finance, where we safeguard our pockets similar to our lives.

I fully recognize the advantages of a college education; it is the boiled-down experience of practical people in the profession, placed in a form for assimilation through hard mental effort. The courses of study taken give an advantage to the student, over the practical man, in this particular only, namely, the student gains in knowledge in a short period what the practical man often spends a lifetime of practical service in the effort to acquire. Against this, the practical man only studies the subject matter necessary as required, while the student gets the knowledge before being able to put it to use. As for the mental training, it is my opinion that the practical man who rises above the ordinary in the profession, gets his mind fully as well disciplined. It is a course which no college can give to the same advantage. There is little room for conceit on the part of the college man with a degree. Viewed in the light of results secured for the

investing public, it is hard to judge which side of the controversy has the best of it.

In regard to the term 'mining quack,' there is one particularly pernicious example to be spoken of. 'Viator' wishes to identify the breed by the giving of the letters M. Q. Two more letters should be prefixed—G. T. (Globe Trotting). More often than otherwise the particular quack of which I speak is a college man with a string of letters tacked on to his name for all the societies in the world. Such men make it a business of examining properties all over the world, and the ease and celerity with which they size up economic and mining conditions that puzzle the heads of old residents familiar with them, is astonishing. They presume to be competent to give advice to intending investors on transportation, labor, mining, and other features, in periods of from three days to three weeks sojourn in the districts examined. They probably never saw the country before, and can have no realization of the nature of the intricate problems on which they are to give advice. These men are the egotists of the profession. Every country suffers from their operations and snap judgment, and if the term 'mining quack' is to be handed around, they can fully qualify for the label. There are good men, but, from my own practical observation they seem to be mighty scarce. The good are generally specialists in certain metals. The rest might be classed as 'jacks of all trades.'

The writer is a newspaper man, who never examined a mine for pay, who would sooner risk his own dollars in an investment any time, than recommend one to the innocent public. Observation has turned his mind into a sifting machine, for the separation of the good and bad in the industry. Profitable results to investors is the basis from which to figure, and that is the only true basis from which should come the judgment as to who should, and who should not, be called a 'Mining Engineer.'

GEO. HUSTON.

Sandon, B. C., August 18, 1906.

[This letter is discussed in our editorial columns.—Editor].

Concerning Foremen.

The Editor:

Sir—In a late issue of your valued paper a correspondent indulged in playful criticism of the extract you printed from 'The Business of Contracting,' on the selection of a foreman.

I agree with his ideas in some respects but believe he did not read carefully the article he criticised. For instance the following paragraph:

"If he is worth keeping for a third job he is likely to have in him qualities which will lead to his being safely intrusted with more important work, or which will enable him to secure backing to go contracting for himself."

If your correspondent read that paragraph carefully he might have omitted some of his remarks. In his letter he says practically the same with reference to a foreman going in for himself. He is like too many people who confuse the foreman with the superintendent. In my little pamphlet the difference between the two positions is clearly shown. Each has a chapter to himself.

Your correspondent believes every man in charge of men is a foreman. I confine the term to a man controlling one gang. The man in charge of a job, with foremen under him, is a superintendent. He furthermore declares that such men are born and not made. That is an old-fashioned belief. The wonderful industrial advances of today tax severely the world's output of 'born' foremen. Consequently they must be made. Made they are in great numbers and the manufactured article is fully as good as the natural.

The drunken foreman of olden days finds he is no longer wanted. The supply of clear-headed trained men is not great enough to be encouraging, but nowadays contractors will risk a green man sooner than they will risk the 'born' foreman who goes on sprees.

ERNEST MCCULLAUGH.

Chicago, August 31, 1906.

Who Is a Mining Engineer?

The Editor:

Sir—Your article on this subject appearing in a recent issue of your paper is well founded. Allow me to make some comments, which I think timely:

There are many people who term, or style themselves, mining engineers. From whence and how they hold these titles is a conjecture. Some possibly by paying stated dues to some society of mining engineers. Mining itself has many ups and downs, and is well seasoned with fraudulent schemes, intentional or otherwise, and these conditions have an influence on the manipulator in the industry, be he owner, shareholder, mining engineer, superintendent or foreman. But, I wish to dwell only on the legitimate side of the question: 'Who is a mining engineer?' and of the conditions now prevailing.

First, we must define the term, a mining engineer. He should be an intelligent person, of sound judgment. He should understand mining and have served in all capacities in different mines under different conditions and in various districts. He should also be competent to make surveys and assays, have an intimate knowledge of geology, and move with the times in all progress made in the arts and sciences of modern mining. Too many technical young gentlemen appear upon the arena, lacking practical experience, or the proving of themselves in their profession. These young men are intelligent, it will be granted, and deserve consideration and patronage at the hands of their seniors. They are the future of the profession for the coming generation in the mining industry. But, I find a good many of these young men in various capacities, as consulting engineers, mine superintendents, or as engineers in control of mines, where more mature experience and counsel is sometimes the pivotal point between failure and success. We find other of these young men throughout the East holding forth in well-appointed offices, with the badge of a college education and certificate of M. E., ready to give expert opinion in any and all matters affecting mining affairs, from chemistry to business management.

Young men may be graduated from reputable schools as doctors and lawyers. But, the graduation certificate does not necessarily make these men doctors or lawyers. There are just as many incompetents in these sister professions as in mining—the only difference being that they are licensed to practice, and so long as they do not commit crimes against society they are permitted to go on throughout their career without other annoyance than the fear of being found out. It is true, mining engineers are not licensed by the State, they may be required to register, but I mean the badge of efficiency is not given or required. It would be well if some standard could be reached, but alas for the frailty of human thought and action, I fear there can only be the one test, and that the one of duty well done with honesty of purpose. The interests seeking such services will have to pay to find them out, and not finding them, will suffer the consequences of the failures due to the hazard of mining when pursued as a sort of Alladin's Lamp flash to wealth. But, a better day is dawning. Let us hope so.

E. RAMMELMEYER, M. E.

Boise, Idaho, August 18, 1906.

The Refining and Toughening of Impure Bullion.

In the *Transactions* of the Institution of Mining and Metallurgy, T. K. Rose has a valuable article giving the results of his investigation on the refining of impure gold residues or bullion. This, together with the discussion of the subject by various members of the Institution, has been summarized.

In this connection 'refining' means the method of removing impurities or base metals from gold or silver bullion, while 'toughening' may be defined as the removal from high-grade bullion of small quantities of the impurities which make it brittle. Toughening, therefore, is but a final stage of refining.

For the oxidation of these impurities, nitre has been quite commonly (and successfully) used, the chief objection being the corrosion of the plumbago crucible by the nitre, and the losses which result from the method—running to as large a figure as 10%, mainly due to mechanical causes. Commonly the nitre has been put upon the top of the metal after melting in a crucible, the oxidized impurities then being taken up by a borax-and-silica slag. With the finely divided zinc-box slime, nitre has been mixed, with the idea that less loss would result. The losses, however, have been so great that the mills have shipped away the impure bullion at a reduced price, such, that for the lower grades, there was a difference of 40 cents per ounce. This low-grade product has also been difficult to sample and assay because of its irregular composition. The table herewith shows the composition of acid-treated and calcined or roasted zinc-box slimes:

	I.	II.	III.	IV.	V.
	%	%	%	%	%
Gold	34.0	36.1	37.3	49.8	4.4
Silver	4.3	3.5	3.7	9.5	.....
Zinc	.....	7.5	6.2	.....	39.1
Zinc oxide	22.5	.....	.....	0.2	.....
Lead	.....	20.8	20.0	3.0	.....
Lead oxide	15.6	.....	.....	.....	.....
Copper	.....	2.5	2.5	.....	.....
Lime (CaO)	.....	.....	.....	.....	20.5
Silica	7.5	12.6	16.2	15.6	6.0
Sulphur trioxide	6.8	6.3	13.7	11.3	6.5

These precipitates are:

I. Acid-treated and roasted gold slime from the Robinson Deep Mining Co., South Africa.

II. Acid-treated slime from the East Rand Proprietary Mine, South Africa.

III. Same slime after roasting.

IV. Acid-treated and roasted slime from the Brodie works, Cripple Creek, Colorado.

V. Slime from the Mercur mine, Mercur, Utah. This slime contains 36.7% calcium carbonate.

Ordinary zinc, such as is used for gold precipitation, contains upward of 1% lead, a small quantity of carbon and other impurities, as arsenic and antimony, which of course find their way into the slime.

Treatment of the slime: The acid-treated (or even untreated) slime is mixed with molasses or pitch, so as mechanically to bind the dry powdery precipitate together, and this, upon charring, cokes to a sponge or skeleton of carbon, having the effect of keeping the particles together, and of permitting the evolution of metallic zinc vapor entirely free from gold, as well as exerting a reducing action on any zinc oxide that might be present. This is charged into a black-lead crucible and the temperature brought up to a yellow heat, or to the distillation point of zinc. The crucible is covered with another old inverted crucible, forming a hood with an opening at the side having a lid. At the high temperature a flame of zinc issues from this opening, the lid being partly displaced. When the flame has died out, a mixture of borax and sand is introduced through the opening of the hood. When this has melted, and after about 15 min., a clay pipe half-inch exterior diam. by 24 in. long, having one-eighth inch bore, is introduced through a hole at the top of the hood, extending down into the metal. Compressed air, in a regulated stream, is then blown into the molten metal. This stream is first passed through a wash-bottle, through which, as it bubbles up, one can judge the rate at which it is passing through the metal. The first result of the passage of the air is a brilliant white flame, probably due to a mixture of arsenic, antimony and zinc. The violence of the reaction may be checked by moderating the flow of the air. In about an hour the slag has become quite liquid, all excess of silica having disappeared. The stream of gas is then stopped and the charge poured at the end of 20 min., the total time having been three hours. The slag should be liquid, brown in color, and the crucible not corroded. The slag is poured with the metal and adheres firmly to it. A good part may be broken off, and the residual metal is then re-melted and quenched as rapidly as possible, when the slag can be taken off by hammering. In place of adding the fluxes all at once at the beginning of the blowing, they may be added in three or four portions, so as to take up the base-metal oxides as they form.

Composition of the slag: Borax alone is unmanageable, the mixture of borates attacking the crucible vigorously; sand accordingly was used. By a series of experiments it was found that a slag having a composition, $2Na_2O$, 9RO, $4B_2O_3$, $9SiO_2$ was satisfactory. In this formula R=Ca, Mg, Pb, Zn, Cu, Sb, 0.67 Fe and 0.67 Ni, and it corresponds to the proportion of 3 parts of borax-glass to 4 of sand. For each equivalent of silica we have one of base. It has been found that the zinc is volatilized, so that its percentage in the remaining metal is about 10%. Taking precipitate No. II for example, and dividing each percentage by the atomic weight of metal, we find

$$\frac{7.5\%\,Zn}{65} + \frac{20.8\%\,Pb}{205} + \frac{2.5\%\,Cu}{63} - \frac{12.6\%\,SiO_2}{60} = \frac{0.8\%\,SiO_2}{60}$$

which indicates that in 100 oz. of the precipitate we need barely one pound of sand with, however, three-fourths (12.6+0.8)=10 lb. borax glass.

In precipitate No. V the 10% zinc remaining, just before blowing the air, is approximately

$$\frac{100\%-(39.1\%-10\%)}{10} = 7.1\%,$$

so that calculating as before

$$\frac{7.1\%\,Zn}{65} + \frac{14.7\%\,Ca}{40} - \frac{6.0\%\,SiO_2}{60} = \frac{22.6\%\,SiO_2}{60}$$

Thus, in 100 oz., we would need to add 23 lb. sand and 0.75 of the total of 28.6% SiO_2, or 21 lb. borax glass.

Dr. Rose carried out a series of experiments using oxygen gas instead of air. He found, as might be expected, that the reactions were quicker but more violent, and the clay tube was attacked. The toughening of the purer gold bars was carried out in the same way as above outlined, except that the preliminary distillation was omitted, and the clay pipe introduced into the metal as soon as it had been melted.

Action of oxygen on mixtures of molten metals: Generally speaking the base-metals are oxidized successively with the evolution of heat as follows:

	Calories per molecule.	Calories per lb. of metal.	Atomic vol.
Zinc oxidized to ZnO	82,700	1,270	9.1
Iron oxidized to Fe_2O_3	199,400	1,780	7.2
Lead oxidized to PbO	50,300	240	18.1
Nickel oxidized to Ni_2O_3	120,300	1,020	6.7
Copper oxidized to Cu_2O	37,200	290	7.2

The order of oxidation of other elements is less certain; they are:

	Calories per molecule.	Calories lb.	Atomic Vol.
Antimony oxidized to Sb_2O_3	165,900	1,480	17.9
Arsenic oxidized to As_2O_3	154,800	1,030	13.2
Carbon oxidized to CO	97,000	8,080	
Bismuth oxidized to Bi_2O_3	138,000	660	21.1
Tellurium oxidized to TeO_2	77,200	600	20.2
Sulphur oxidized to SO_2	71,000	2,220	

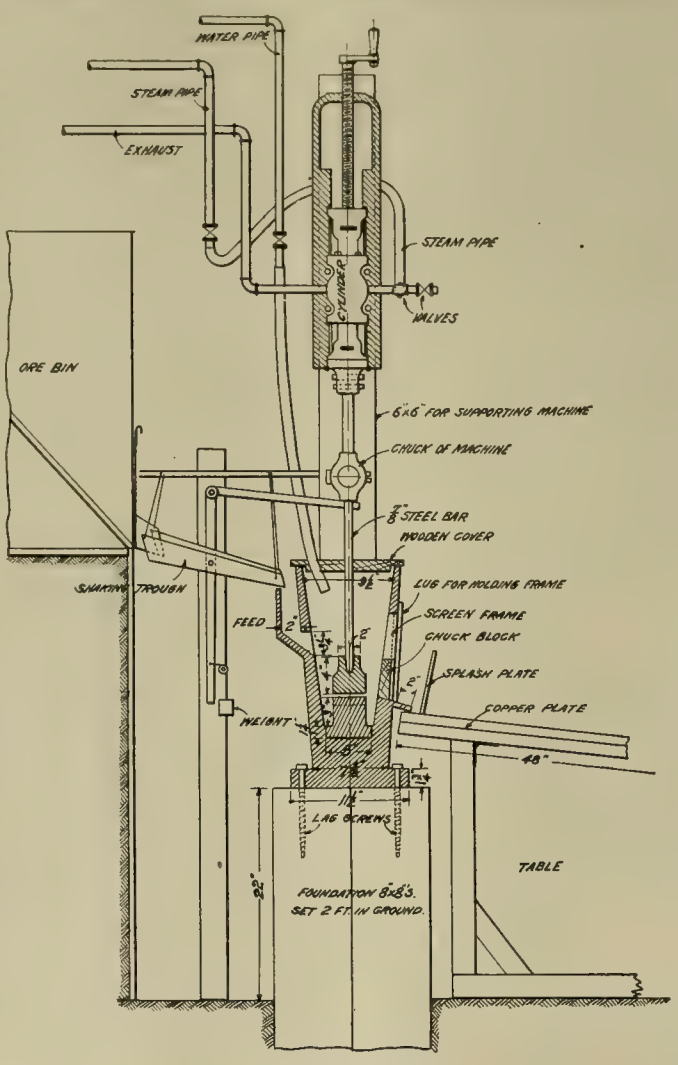
In the first list copper containing a little Cu_2O (and the last on the list) acts as a carrier of oxygen to small quantities of more oxidizable metals, hence, when present, it considerably shortens the operation of toughening. Thus standard gold, containing 8.33% copper, was toughened by a short blow, while pure gold was more troublesome. The atomic volume of gold is 10.2 and it will be noticed that the metals whose atomic volume is very different from it, as lead, antimony, arsenic, bismuth and tellurium, embrittle it, while copper, of lower atomic volume (7.2) does not lessen its toughness. All metals during the blowing are to some extent oxidized simultaneously, and here mass action plays its part, but a mixture of metals can be roughly separated from one another by successive oxidation, each metal in turn partially protecting the next in order, while the latter acts as an oxygen carrier for the former. Thus zinc, which goes first, serves to protect the iron from oxidation until itself removed, while the iron, during this time protected from oxidation, is passing on any oxygen it may have taken up to the zinc. The elimination of the last traces of all impurities from gold is not practicable, so that some copper (or silver) should be present in the charge if tough gold is required, in order to insure the expulsion of deleterious elements. Silver itself, when refined, remains brittle in the absence of copper, owing to the retention of oxygen, which can, however, be removed by melting under charcoal. The oxides of bismuth and lead are mainly volatilized, or are taken up into the substance of the crucible. Part of them, however, remain dissolved in the oxide of copper, so that the effect of blowing is analogous to the poling of copper. In over-poled copper traces of impurities, such as lead or antimony, are reduced to the state of metals and make the copper brittle. Their oxides are innoxious in presence of copper oxide. It has been found that, if a cover of borax be added, the oxides of the deleterious elements are taken up by the slag.

An Ingenious Stamp-Mill.

Written for the MINING AND SCIENTIFIC PRESS
By LOUIS FOGLE and REGINALD LEONARD.

The subject of this article is a steam stamp-mill built to duplicate in a small way the results of large-scale work in milling and amalgamation.

The Mining Department of the University of Idaho possessed a 'baby' Ingersoll drill, the power for which was obtained from the boilers of the heating plant. It was proposed to make a mortar duplicating a large stamp-mill in having a movable die and the same feeding and screening arrangements, and to use the drilling machine for lifting and dropping the shoe. The patterns for the mortar, shoe, and die were turned on the lathes of the school. The castings were made by a Spokane foundry and weighed as follows: Mortar 180 lb., die 12 lb., and shoe 9 lb. The mortar is ½ in. thick at the top, increasing to 1½ in. on a level with the die. A flange 2 in. wide serves to secure the mortar to the foundation; this is built up of four 8 by 8-in. timbers bolted together and set two feet in the ground; a 6 by 6-in. post, bolted to the side of the foundation and extending some distance above it, supports the machine. The mortar was fastened to the block by three lag-screws. This was sufficient to hold it securely and there was practically no jar noticeable on touching the foundation when the machine was running. The shoe is carried by a ⅞-in. steel rod having a taper end fitting the hole in the top of the shoe, the bar being held in the chuck of the drilling machine. The machine was found to work best with a stroke of 4 in., the number being about 200 per min. with 80-lb. boiler-pressure. The ore is fed to the mortar by means of a shaking trough to which a backward and forward motion is imparted by means of a lever operated by the chuck of the machine. The amount of motion is controlled by means of stops and a weight. The feed-opening was designed to throw the ore on top of the die, and was made of larger area at the bottom to prevent choking. The screen-opening on the opposite side is a rectangle 5 by 9 in.; this has proved a little too small. A wooden screen-frame is used and the depth of discharge is varied by means of chuck-blocks. The pulp flows from the lip onto



An Ingenious Stamp-Mill.

an amalgamated copper plate 2 by 4 ft., which is supported by a solidly built table having adjustable legs for varying the slope. The pulp is caught in a vat and kept for further treatment.

The first lot of ore run through the mill was a low-grade, extremely hard white quartz containing less than one per cent galena, blende and pyrite. It was first run through a small Dodge crusher to pass a one-inch ring, weighed, sampled and assayed. The lot was then taken to the bin of the mill and the stamp started. The run was made with the idea of determining the consumption of water, the capacity of the mill, and its efficiency as an amalgamator. The determination of capacity was not successful, owing to over-feeding, due to improper working of the automatic feeder. The second lot of ore tried was a high-grade quartz which had been previously crushed to pass a 5 mm. screen. The fineness of the material hindered, rather than helped, the crushing in the mortar. The third trial was made on another lot similar to that of the first run. The feeder having been adjusted, this test demonstrated the capacity of the stamp better than either of the others. To help amalgamation and insure the removal of all the gold caught, a coating of silver amalgam was used on the plates. No mercury was fed with the ore, but on cleaning out the mortar after the second run, a large amount of free gold was found. This was amalgamated in a gold pan, silver amalgam being added to guard against loss in the subsequent retorting and melting. The results are given in the following tables:

TABLE I. DETAILS OF RUNS.

Run number.	Weight of ore.	Assay value.	Gold in lot.	Time.		Water per ton.	Crushed per day.	Assay tailing.	Value bullion.	Extraction—%.	Actual %.
	lb.			hr.	min.	gal.	lb.				
1	535	$2.48	$0.66	9	42	938	1,360	$1.24	$0.264	50	40
2	156	44.65*	3.48	2	7	938	1,780	6.71	2.96	.....	85
3	160	2.48	.....	1	30	938	2,670	1.14	.....	54	.....

*Assays of this ore (Lot 2) varied a great deal on account of coarse free gold, and the value was arrived at by taking the sum of bullion recovered and the assay of the tailing. The extraction by assay and the actual recovery are therefore the same.

TABLE II. DETAILS OF BULLION.

RUN NUMBER.	Weight of bar—Grams.	Fineness, parts per 1,000.	Amount of gold in bar—Grams.	Value of gold.
1	33.24	12	0.399	$0.264
2 (on plates)	17.99	58	1.04	0.67
3 (inside mortar)	16.595	209	3.47	2.29
Lot 2, total gold	.....	.....	4.51	2.96

The efficiency of the mill as an amalgamator seems to be high, and furnishes a means of testing small lots by amalgamation. The extraction of 50% from the first lot was satisfactory, especially since it had been claimed that the ore could not be amalgamated. Ore from the same mine had been previously run through a stamp-mill and no recovery made. The reason offered was the presence of arsenic (?) in the ore. A sizing test was made on the pulp with the result shown in Table III. A 40-mesh woven-wire screen was used on the mortar.

TABLE III. SCREEN TESTS.

Through 40 caught on 60	32 %
Through 60 caught on 80	10 %
Through 80 caught on 100	7 %
Through 100 caught on 120	17.5%
Through 120 caught on 150	8.5%

The results shown above indicate a pulp of about the same sort as is produced in ordinary stamp-milling.

How Nuggets May Be Made.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES S. PALMER.

Nuggets of copper, silver, or gold are common enough to deserve a word regarding their origin. The probable chemical state of copper and silver in their original ores, was that of the sulphide; this is shown by the general relations of the outer oxidized crust of the globe (where oxygen reigns supreme as the active agent of change), and the next deeper layer, where sulphur combines with the metals to make the original ores. Of course, in these remarks, the word 'original' is used almost apologetically; for what can we, the creatures of a day and the dwellers in a valley, what can we really know of anything original? We may use the word as meaning the farthest back that we can trace the substance in question. For we know that while we can never prove it absolutely, yet all the inferences from well-known facts indicate that the earth has a centre, which, as compared with the exterior, is heavy, unoxidized and metallic.

To anyone studying the problem of nuggets, it is obvious that the gradual oxidation of a sulphide, such as of copper, would result in the production of a metallic residue; because the principal sulphide copper glance is a cuprous sulphide, in which there are two atoms of copper to one of sulphur; and the only really soluble sulphate of copper is common blue vitriol, cupric sulphate, which has one atom of copper to one of sulphur. Hence, when the cuprous sulphide ore is oxidized, *all* of the sulphur could go off with one-half of the copper in the form of soluble cupric sulphate; and another half of the copper could remain behind as metallic copper.

In the case of iron, the common original ore would seem to be the ubiquitous pyrite; this is a super-sulphide, in the sense that for one atom of iron, there are two atoms of sulphur; hence, when this substance is oxidized, if the iron goes only to the ferrous sulphate, there is more than enough sulphur to make the sulphuric acid necessary to carry off the iron as soluble sulphate; while if the iron goes to the form of ferric sulphate (which is soluble), even then there is more than enough sulphur to carry the iron. This fact may be one of the explanations of the remarkable fact that native iron is very much more rare than it should be on the crust of the earth, even considering its readiness to oxidize. And this rarity of native iron, in proportion to the abundance of such ores as pyrite and marcasite, is entirely in keeping with this excess of sulphur in pyrite and marcasite which have more than enough sulphur to take care of the iron as it is changed into the soluble form of sulphate.

The case of silver is equally instructive. The common original ore is silver glance, or the sulphide, with two atoms of silver for one atom of copper. These proportions are the same (as far as the silver and sulphur are concerned), as the proportions of silver and sulphur in the silver sulphate that would be formed on the oxidation of the silver glance. In plain English, this means that all the silver could be soluble; and, in the simple oxidation considered by itself, there need be no metallic unoxidized residue of native silver (as in the case of the copper). This fact is met by another fact, namely, that from a solution of silver sulphate, metallic silver is easily reduced and thrown down by the weakest reducers (such as certain organic compounds, or ferrous sulphate, or metallic copper); and this is simply sufficient to explain the comparative abundance of native silver.

When we come to gold, we are met by the fact that, argue as we will, we have no sharp proof of the non-existence of gold sulphides in nature; and they are well known in the laboratory. If such could exist, by the oxidation

of the mixed sulphides in which gold usually exists, a solution could be made from which the gold would be reduced by the ferrous sulphate, or by the metallic copper; and if copper and silver were together, by the silver reduced from the copper. But in the total absence of certain knowledge on this point of the condition of the gold, and assuming that it is usually in the form of metal disseminated through pyrite, it is clear that all the rest of the ore could oxidize and flow away, leaving the gold in the form of particles more or less agglomerated.

It is evident that the theoretical analysis of the question of the production of metallic copper, silver, gold, and iron, by the oxidation of their respective sulphides, is well in keeping with the facts as known. By the way, it should be mentioned that some of the double ores of copper and iron, such as chalcopyrite, have enough sulphur to carry off all the iron as ferrous sulphate, and all the copper as cupric sulphate; and the sequence of finding first silver and silver ores in such regions as Butte in the early day, to be succeeded by the finding of copper ores at lower depths, is no accident, but illustrates the same laws that have been touched upon thus far.

Now, on the practical side, I have a set of oxidation products of artificial sulphides that would seem to be almost a complete epitome of the formation of metallic copper from matte. The specimens were found in a riffle in a launder which was used to carry off the waste slag from the large blast furnaces of the Washoe smelter, in Montana. This water is a hard water, but otherwise exhibits no peculiar properties, except its heated condition due to the cooling of the molten slag which falls into the launder in a constant stream. The launder slopes so that the current is rapid enough to carry off blocks many times larger than the powdered slag, which will average from the size of a cherry down to fine shot. This rapidity of the water gives the current force enough to roll and pound any lumps, coarse or fine; and the riffle would make an ideal artificial 'pot-hole' wherein the rolling and rotating pieces of matte could oxidize, and, at the same time, hammer themselves to a coherent mass.

The specimens of matte are sufficiently complete to enable one to trace almost every stage, from the first in which the change has only well begun, to the last where the shape of the original matte is lost, and the metallic copper is clearly of the nugget type, with the characteristic 'thumb-marks,' and potato-shape. The lines of blow-holes of the original matte are well preserved in some cases, the analysis showed the concentration of gold and silver along with the copper. The series and the changes are quite complete.

To test the observation of the apparent formation of nuggets from matte, I took a series from the common low-grade 40% copper to high-grade white metal. These were placed on a stove in a common casserole and kept covered with water, which was poured off once or twice every day. The stove on which the casserole was placed was kept hot only a small part of the time each day; but even with this rough imitation of the slag launder, the incipient change which took place in five or six weeks was striking. The high-grade matte began to oxidize most, the rusty portions showing much copper when burnished with a knife point. It should be mentioned that these specimens of matte were selected for experiment which showed little included free copper.

With the matte, several pieces of copper glance were tested. These began to oxidize, but not nearly so much as the matte; but all clearly started on the road to the copper nugget condition. Judging from the amount of change effected, it would require at least a year to oxidize an inch lump of matte to good nugget form; and there is one feature of the launder which cannot be imitated on a kitchen stove, namely, the rolling, tumbling, and pounding of the metal to make it more coherent. That the general method of alteration to nuggets is imitated herein, there can be little doubt, at least in certain phases.

The lumps of matte in the riffles of the slag-water launder were undoubtedly stray drops from the pots that stand near the launder; and it was their heavy specific gravity that put them in the riffles and kept them there. It was a fortunate observation that brought them to light, for they are one more link in the chain which gradually shapes theory into fact; the specimens were given to me by an old observer who sees and finds everything.

There is said to be nothing great and nothing small in the world—in the sense that the great and the small are intimately and mutually connected with each other and with the same causes and results. This suggests that the making of a small nugget may be closely connected with the making of a big one; and the same process herein described may be related to that which placed such enormous deposits as those of the Lake Superior region. Certain it is that the longer men study nature, the more do they incline to explain all changes by the common ordinary agents that can be seen at work in daily activity about them. It may be only a step, and that a small one, from the nugget of the launder of the copper smelter, to the copper mass in a Calumet & Hecla mine.

BARYTES.—This is the common name in the United States, where it would be an affectation of simplicity to name it, as in England, 'heavy spar.' The pure mineral (barite) $BaSO_4$ has a specific gravity of 4.5, and so is much the same in density as the white lead with which it is mixed as an adulterant. For such purposes it is largely mined in Virginia and Missouri, small amounts only coming from North Carolina, Illinois, and other States. It is found in nodules and boulders of float mineral imbedded in clay, as also in regular beds. It is prepared by picking and washing for subsequent grinding, and should be free from metallic impurities which discolor it, and from quartz grains. It is coarsely crushed, then wet-ground under granite stones. Next it is treated with dilute sulphuric acid for the purpose of removing the iron oxide; the solution is then drained from the vat and the mineral washed with water until freed from the acid and dried. It is one of the most important and durable of pigments, coming in importance next after white lead, and is insoluble both in acids and alkalies. As an adulterant it can be employed to the extent of 35 to 50 per cent. The best grades range in value from $15 to $20 per ton, and the raw mineral is worth $6 per ton in St. Louis.

MACHINE AND HAND-DRILLING.—The rate at which a tunnel can be driven by means of rock-drills may be safely taken at double the speed of hand-work. Thus, in driving the Vosburg tunnel (8 by 20 ft.) on the Lehigh Valley railroad, through a uniform hard gray sandstone, by hand-drilling, the progress was 67 ft., while by machine-drilling it was 173 ft. monthly. For driving or for sinking, rock-drills are far superior to hand-labor, both in speed and in economy. For stoping, however, except in wide stopes, the differences are not so marked, as it is difficult to maneuver a machine in places where a man can hardly find room to work with a single-hand hammer. The great advantage in the use of rock-drills is undoubtedly the increased speed with which a mine can be developed and ore reserves created, since, for cost per yard, there is not much difference between either that or hand-drilling. The point is a little difficult to decide, but it would be safe to say that the average cost per yard by either system is the same for ordinary mine drifts, while, for full-sized tunnels, machine-drilling is cheaper.

Examples of Faulting.

In a recent issue of *The Queensland Government Mining Journal* we find several interesting examples of faulting in the Golden Gate mine at Croydon, Queensland. We have re-drawn six of the diagrams, correcting obvious errors in Fig. 5 and 6. Of the first group, Fig. 1 shows the Golden Gate Reef broken by a dike and subsequently faulted by a movement along the lower wall of the vein, dislocating the dike. The same vein and dike are shown in Fig. 2, where the western part of the vein is faulted along the hanging wall of the dike from *c* to *d*. Finally, in Fig. 3 the vein and the dike and the later fault-plane are all thrown to the east along a thrust-plane *g h*, breaking the dike at *e f*.

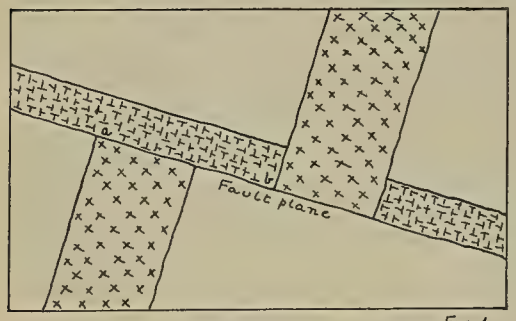


FIG. 1

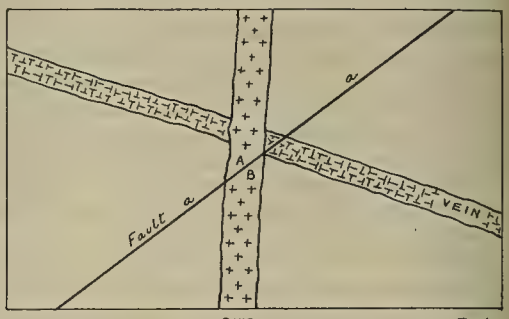


FIG. 4.

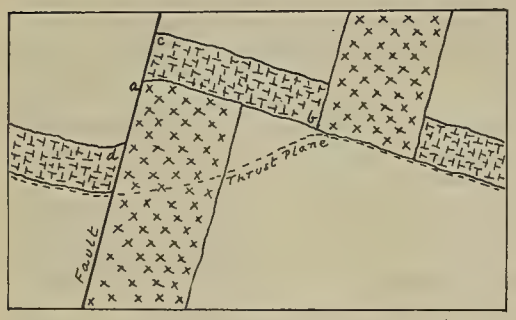


FIG. 2

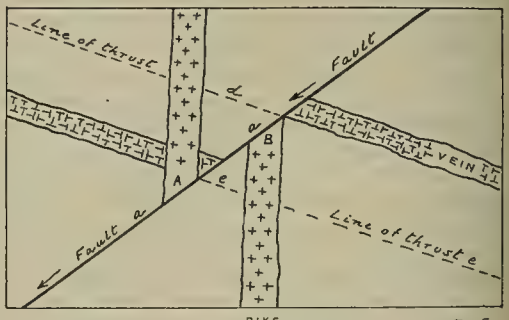


FIG. 5

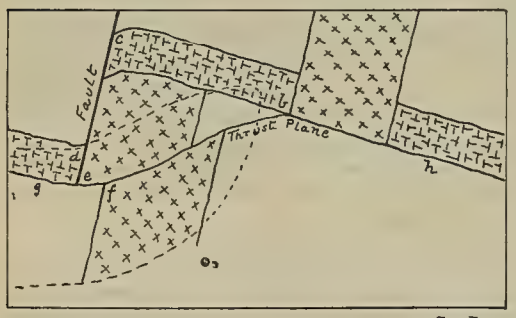


FIG. 3

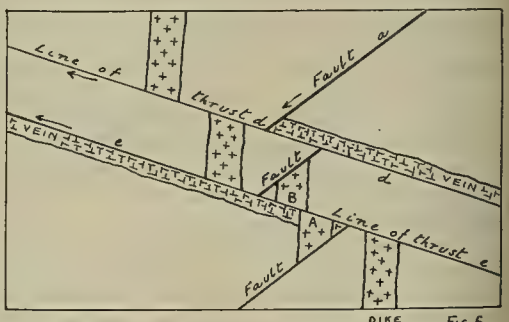


FIG 6

Two Examples of Complicated Faulting.

In the next series, reversed faulting along two planes is illustrated. Fig. 5 shows the quartz vein cut by a dike, which is subsequently crossed by a fault *a a*. This is a normal fault as indicated by Fig. 2, where the upper half of the dike at *A* is lowered below *B* and the vein is separated by an equal displacement. Finally, in Fig. 3, we get a complication of movements due to two thrust-planes along *d d* and *e e*, the result being that the two parts of the dike are shifted again so that two of the original fragments at *A* and *B* are now upside down, and the plane of the first fault is disrupted twice. Such a complication would worry a mine superintendent, whose winzes and drifts would be multiplied in the effort to ascertain the position of the ore. Dirgrams such as these are useful in suggesting an explanation of occurrences underground, for it is not often that a mine manager is keen enough on structural geology to unravel such a complicated tangle off-hand. A good example of a multiplicity of faults in a single mine was afforded by the Enterprise at Rico, as described in Vol. XXVI of the *Transactions* of the American Institute of Mining Engineers. These series of four or five veins were faulted on an average every sixty feet, so that the superintendent and manager had to face a fault at least once every week. As a matter of experience it was found that one rule worked in almost every instance and the exception was obscure. The rule was that if the drift or stope met the fault on its hanging-wall side, you looked for the broken portion of the vein on the hanging-wall side of the vein, if the drift cut the foot-wall of the fault-fracture, then the other part of the ore vein was to be found on the foot-wall side of that vein.

HARMONIOUS order governing eternally continuous progress—the web and woof of matter and force interweaving by slow degrees, without broken thread, that veil which lies between us and the Infinite—that universe which alone we know or can know; such is the picture which science draws of the world.

A Hot-Blast Stove Efficiency Test.

Written for the MINING AND SCIENTIFIC PRESS
By HERBERT HAAS.

The use of heated air in pyrite smelting gives renewed interest to the U type of stove. Such stoves are now but little used in iron metallurgy, having been displaced by the more efficient regenerative hot-blast fire-brick stoves of the Whitwell & Cowper type. Unfortunately, these old U-pipe stoves were adopted without alterations to meet the radically different conditions in pyrite smelting, where the ratio of air-volume to pressure is greatly different from that common in iron blast-furnace work.

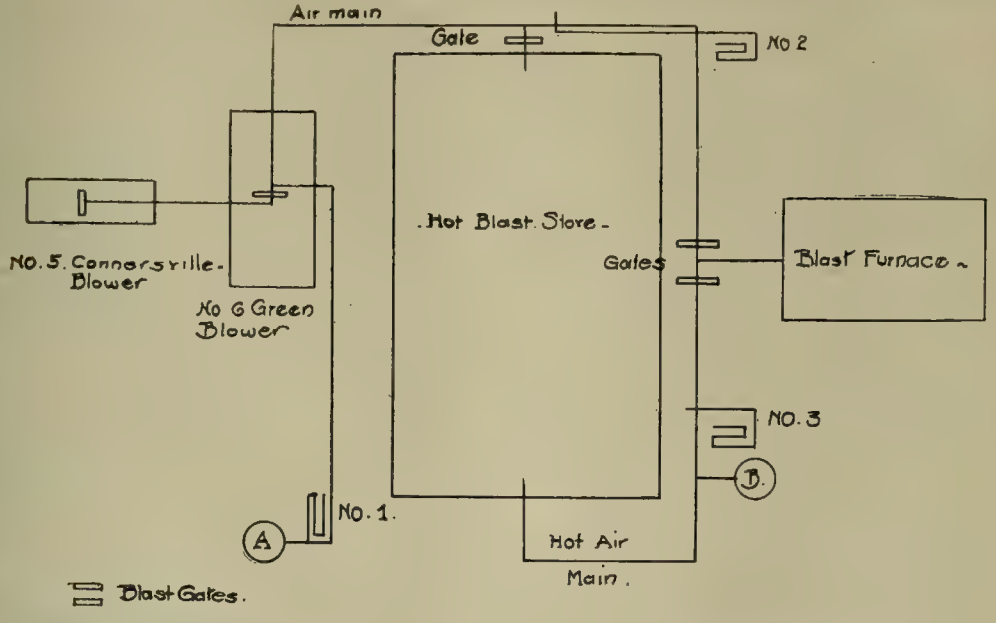
It is therefore not surprising that the copper metallurgist condemns the hot-blast stove as an extremely wasteful apparatus. Mr. Lang, for instance, places the thermal efficiency of the common U-pipe stove at 50%, and the frictional losses at from 6 to 16 oz. over the pressure registered at the blower. In the report of the Secretary of Mines, Tasmania, treating at length on smelting at Mt. Lyell, it is stated that the blast-pressure ranged from 36 to 40 oz. at the blowers, and from 30 to 34 oz. at the furnaces, the difference at the two points being lost by friction in hot-blast stoves, blast-mains and furnace-connections. In other words, from 15 to 17% of the pressure recorded at the blowers is lost in the manner stated.

I designed a hot-blast stove, a description of which appeared in *The Engineering and Mining Journal*, December 29, 1904, to meet the radically different requirements in pyrite smelting. The stove was built and used in connection with the blast-furnace plant at the Afterthought smelter at Ingot, in Shasta county, California. The following notes describe an efficiency test of this stove:

From careful records, during the months of March to July, 1905, of the average volume of air heated per 24 hours, the average air-pressures at blowers, inlet and outlet of hot-blast stove, and tuyeres, average temperature of inflowing and outflowing air, average temperature of composition of combustion-gases at the stove-flue outlet, the average heat-value and quantity of wood burned, the working conditions of the stove were determined. The accompanying diagram gives the arrangement of the air connections, with the position of the different instruments. All of these were manufactured by the Schaeffer & Budenberg Mfg. Co., New York. In the blower room a Metropolitan recording pressure gauge was used for registering the variations in air-pressure during one day's operations. It is indicated at *A*. A syphon pressure-gauge was installed alongside, for purposes of comparison (1).

No. 2 and 3 are syphon and open pressure-gauges; No. 1 and 2 had a range of 5 lb. each, with subdivisions of 1 oz. pressure per sq. in. These gauges were tested occasionally against columns of water, affording better opportunity for observing slight changes of pressure.

B is a combined recording and indicating mercury pyrometer, with temperatures from 100° to 1,100° F. As will be seen from the diagram, pressure determinations were made at three points, to wit: At the blowers; at the hot-blast stove-inlet; and at the outlet. The average air-pressures were 24 oz. per sq. in. recorded at the blower. The average pressures recorded by gauge No. 3 ranged from 22 to 23 oz. per sq. in. This represents a frictional loss of 4 to 9% of the initial pressure at the blower. The loss between No. 2 and 3 never exceeded 3%; it is interesting to note that the average frictional loss estimated when the stove was designed was 4 per cent.



No. 1 and 2. Syphon Pressure Gauges.
No. 3. Open Pressure Gauge.
A. Recording Pressure Gauge.
B. Recording Thermometer.

To determine the thermal efficiency of the stove the recording pyrometer was used.

Average volume of air heated per 24 hr., in cu. ft. per min	7,500
" temperature of air going into stove	66.2° F. = 19.0° C.
" " " " " out of "	543.2° F. = 284.0° C.
" " of combustion gases	392.0° F. = 200.0° C.

The wood was delivered through a flume. It was in the form of slabs. Average determinations showed that it contained 40% moisture. As a supply had not been accumulated, the wood had to be used in this condition. Calorific determinations of the wood substance (cellulose) showed a heat-value of 3,800 kg. Cal. = 15,080 B. T. U. The average number of cords used was 8.5, at 2,800 lb. per cord, of which 40% was water.

The heat balance was computed to be as follows: Heat furnished by 8.5 cords wood:

2,800 lb. × 60% = 1,680 lb.; 1,680 lb. × 0.4536 kg. × 8.5 cords = 6,477 kilograms.

6,477 kg. × 3,800 kg. Cal. = 24,614,120 kg. Calories.

Heat used—Air: 7,500 cu. ft. × 0.028317 cbm.=212.4 cbm. minutes.

212.4 cbm. min. × 0.2375 (284°–19° C.) × 1,440 min. = 12,247,904 kg. Calories.

Water in wood: 2,800 lb. × 40% × 8.5 cords = 9,520 lb.; 9,520 lb. × 0.4536 = 4,318.3 kg. H_2O. Regnault's formula: W = heat units (kg. Cal.) required for rising 1 kg. water at t° C. to saturated steam at T° C. 606.5–305 (T°–t° C.)=606.5–305 (200°–19° C.) × 4,318.3 = 661.7 × 4,318.3=2,857,419 kg. Calories.

Combustion gases at 200° C., computed from analysis of gases and wood substances (cellulose) which contained 44.4% carbon, 49.4% oxygen, 6.2% hydrogen.

24,614 kg. nitrogen × 9.2438 × 200° C. = 1,200,178 kg. Calories.

3,451 kg. carbon dioxide × 0.2169 × 200° C. =149,704 kg. Calories.

3,200 kg. water × 0.475 × 200° C. = 304,000 kg. Calories.

	Kg. Cal.
Nitrogen	1,200,178
Carbon dioxide	149,704
Water	304,000
Total	1,653,882

Excess of air supplied to fire-box carried away 618,500 kg. Cal.

Air	19,247,904 kg. Cal.	=	78.2% of A.
Water	2,857,419 "	=	11.6 " "
Combustion gases	1,653,882 "	=	6.7 " "
Excess of air	618,500 "	=	2.5 " "
Radiation, etc., to balance	236,415 "	=	1.0 " "

24,614,120 kg. Cal. = A = 24,614,120 kg. Cal. = 100.0% of A.

According to the above results, 78.2% of the heat-value of the wood was transmitted to the blast-furnace in the form of heated air. This is the absolute efficiency. It is low, because of the excess of water in the wood.

With coal or oil fuel, the absolute efficiency would probably exceed 85%. The 19,247,904 kg. Cal. would equal 2,406 kg. coke with a calorific value of 8,000 kg. Cal. or 2.65 tons (at 2,000 lb.). The price of coke delivered at the smelter was $21 per ton, or for 2.65 tons, $55.65. The operation of the hot-blast stove cost $38 per 24 hr. This leaves, in favor of hot blast, $17.65.

In the price of coke, weighing and charging are not included. The cost of heating the blast, with hot-blast stove maintenance, was 25c. per ton of charge smelted. The cost of using coke in the blast furnace and figuring on a thermal efficiency of 100% would have amounted to 37c. per ton.

The amount of $17.65 only measures the commercial gain in using heated air instead of coke. It must also be remembered that the thermal efficiency of shaft furnaces (where material to be heated and fuel to be burned are in direct contact) is from 30 to 50% only; the air would be used with a greater thermal efficiency than coke with the same number of heat-units, so that $17.65 does not represent the entire gain; that is, the higher temperature obtained at the tuyeres by the use of heated air, with accompanying higher re-action powers between iron monoxide and silica means a more rapid oxidation of the iron sulphide.

COMPRESSED AIR can be conveyed in pipes for several miles and still be capable of performing useful, if not economical work. For the transmission of power, whether to rock-drills, pumps or hoists, it has the serious defect that heat is accumulated during its compression. The piston of the compressor must meet, not only the natural resistance of the air, but, in addition, that due to expansion arising from the heat of compression. Taking a cubic foot of air at 0° F., let us compress it to 58.8 lb. per sq. in.; the volume of air will be reduced to 0.3194 cu. ft. and its temperature will have risen to 309.4° F. The absolute need of taking in air to the compressors at as low a temperature as possible, and of cooling the compressing cylinder by the circulation of a constant stream of jacket-water, is evident from the above example.

Waste in Mining.

By SIDNEY J. JENNINGS.

*When men began to analyze the process of mining minerals from the earth, the great cost of preparing the excavations necessary for the purpose probably first impressed them. Some means were sought by which this cost could be reduced. Very soon there probably arose some man with the suggestion to do away with the excavations altogether, his argument probably being that the only necessity for large excavations was to enable men to get to the places where the ore was; that it would be much simpler to get some solvent that would selectively dissolve the desired material from the surrounding waste, and the enriched solution could be pumped to the surface, and there treated so as to separate the solvent from the dissolved commodity sought for. This idea proves wonderfully attractive to some men—all the more so because in certain cases it has been successful. Many salt mines are worked on this principle, and some copper mines under very special circumstances have used this idea, the solvent in these cases being water. I have also heard of one silver mine worked on this scheme, the solvent being hyposulphite of soda. Since the discovery of the solvent action of cyanide of potassium on gold, it was to be expected by anyone possessing any knowledge of human nature that the idea of treating gold ores *in situ* by cyanide of potassium would be suggested. But I must confess that I have been surprised by the number of times this idea has been brought before me and the different classes of men who have suggested it. The care and thought devoted to the perfection of the details of the schemes have been very great, while their essential difficulties have been forgotten in the enthusiasm fired by what their inventors conceived to be a new and great idea. While I am the last who would defend an idea merely because it is old, or who would seek to prevent the enquiry by new minds into old and apparently well-established practice, I think that you will agree with me in including all the energy expended on the above outlined idea in the category of wasted thought.

Situated as most metalliferous mines are, far away from stir of cities and the crowding of men, the administration of a mine tends to become that of a one man show. This undoubtedly accentuates the individuality of the manager, makes him self-reliant and resourceful, but it also tends by that very accentuation of individuality to make him insist on doing things in his own way, without sufficient consideration whether that way is the best one possible. The very resourcefulness of a mine manager induces him to try all sorts of experiments which others have tried and tried again, and whose futility have been thoroughly demonstrated. These defects of the virtues of a mine manager are not so prominent when there is only one mine in a camp, but when, as in Johannesburg, you have over sixty producing mines, the subtle friction of mind upon mind produces all unconsciously to the individual an excitation which is apt to result in a series of experiments, the vast majority of which will have been tried before, and the resulting waste of thought will be great. Some years ago a mine manager boasted to me that he had never been over any other mine on the Rand except his own. His plant showed evidence of this. Some things were excellent, but many designs showed evidences of great ingenuity in doing things in a roundabout way—the same effect being accomplished on neighboring properties in a much simpler fashion.

One of the means adopted on the Rand to obviate this waste of thought has been the grouping of several mines

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*An address delivered before the South African Association for the advancement of science at Kimberley. Abstracted from *South African Mines.*

under one central administration. While undoubtedly centralization when pushed to an extreme can have a deleterious effect in crushing out initiative and reducing the sense of responsibility of the manager, it has had, and when wisely administered will continue to have, a most beneficial effect in making the results of one experiment in any given direction, whether positive or negative, immediately available to all the members of the group, by aiding the manager in all his difficulties with the advice of another experienced and matured mind, thus substituting the deliberate judgment of two men for the possible rash acts of one. Centralization also allows the results achieved in any one department of a mine to be compared on a uniform basis with the results achieved in the same department on any other mine of the same group. Thus while centralization saves the waste of thought in experimenting and resolving problems already adequately disposed of, it promotes thought in showing what other men have achieved in the same line, for nothing gives cause for such quick and steady thinking as a comparison on a uniform basis which shows your own work in an unfavorable light. Centralized management has also other advantages which do not come within the range of our present consideration, and which, therefore, I will not deal with now. Undoubtedly it can be pushed to such an extreme that its evils outweigh its advantages. But these prejudicial effects are not inherent in the idea of centralization; they are mere excrescences which have been allowed to grow on the system, whereas the good that can be achieved by the system is an integral part of the idea on which it is founded. These inherent advantages give the centralized system a vitality by means of which it must survive any surgical operation, however heroic it may be, necessary to cut away its abuses.

Here in South Africa, where the division between laborer and overseer is so sharply accentuated by the color line, where the Kaffir forms such an exceptionally powerful muscular machine, and at the same time is supposed to be so relatively cheap, the temptation to waste labor is tremendous, and is, I am afraid, not always successfully combatted. Not only does this waste of labor comprise the relatively cheap Kaffir, but extends to the much more highly paid overseer; for if laborers are employed in too great numbers on any given piece of work, the cost of supervision must in proportion be unduly inflated. Viewed as a source of human energy, the Kaffir stands high in the scale of laboring people, but from the facts that relative to his wants his remuneration is enormous, and that his sense of responsibility is very inadequately aroused, it is difficult to train him to be as efficient a workman as he is seemingly capable of becoming.

As far as the routine surface work on the mines of the Witwatersrand is concerned, their managers claim, and I think with justice, that the waste of labor has been reduced enormously since the opening of these fields, and that the margin for further reduction in this direction is very small. As an example of what has been done, I would instance the fact that the number of employees in a certain 100-stamp mill with crushers, in the year 1890, was 28 white men and 121 natives; this mill crushed under 5,000 tons a month. At the present time a 100-stamp mill, crushing 14,000 tons of ore a month, will only employ 11 white men and 27 natives—showing that the labor, measured by the tons crushed, has been made eleven times as effective. I have seen, as doubtless many of you have also seen, Kaffirs who looked on a shovel for the first time, and whose conception of its use was limited to placing it on the ground, carefully filling it with ground scooped up in his hands, triumphantly placing it on the top of his head, then bearing it off to the spot to which the ground had to be shifted. And I have also seen Kaffirs who were able in a day to load 40 tons of sand into trucks, and shift them 40 feet, a task which would be considered excellent work anywhere in the world. If the labor force of any industrial venture is largely composed of men like the first mentioned, a huge waste of labor will for a time be the result, whereas if any large proportion can accomplish similar work to that of the second set of workers, then the manager of such an enterprise can view an inspection of his labor sheets with equanimity and unconcern.

While undoubtedly an enormous amount has been accomplished in reducing the waste of labor on the mines of the Witwatersrand, we still have to acknowledge that enough remains to be done to engage the serious attention of those who have the interest of these mines at heart. Personally I am no great believer in what has been called 'dramatic economy of labor.' Under such an impulse, the interest on the capital necessary to be spent in order to save the labor of one man, is apt to exceed the wages which would have to be paid that man. I am, however, a great believer in the slow, laborious, but permanent effect of education on the laborer. Catch the Kaffir young, educate him so that he knows how to work, instil in him sufficient ambition and enough wants to make it necessary for him to work continuously in order to satisfy them, then that very necessity for continuous labor will draw out and increase his sense of responsibility so that he can be trusted to do his work properly without the excessive and wasteful supervision now necessary. Also educate the overseer to realize that he is a foreman of a gang of laborers whom he has to train to work to the best advantage, and, this accomplished, you will have probably reduced the wastage of labor to the minimum possible under South African conditions.

In considering the third kind of waste in mining, that of material, the subject divides itself naturally into two sub-heads:

1. The waste of the mineral sought for.
2. The waste of minerals used in the process of acquiring the mineral.

On the Witwatersrand enormous strides have been made in reducing the first-named waste. In 1891, on one of the better managed companies of these fields, a close inspection of the gold returns showed that only 57% of the assay value of the ore was recovered. In other words, for every sovereign's worth of gold contained in the ore treated only 11s. 5d. worth were recovered; whereas under the latest metallurgical practice on these fields by the use of tube-mills 95% of the assay value of the ore has been banked. This means that out of every sovereign's worth of gold contained in the ore treated, 19s. were put into the bank. Of course the difference between 11s. 5d. and 20s. was not all lost. A large portion of this difference was contained in the tailing which was stored and treated in subsequent years. None the less an immense advance in metallurgical practice has been made; so great indeed has this advance been that on the best equipped mines little remains to be done in the direction of reducing waste of the commodity sought for. The ingenuity of the engineer is exercised in bringing older plants into line with the newest practice at the least cost for capital expenditure.

The waste of stores used on the gold mines of the Transvaal has been great in the past, and continues at an excessive figure. This is a case where the directing brain is practically at the mercy of the performing hands. Large reductions have been made in the cost of coal, explosives, cyanide and candles, which form the four largest items of expenditure of the gold mines. In the case of coal this reduction has been achieved by decreasing the railway rates, and also by a slight reduction in the price at the pit's mouth. The cost of dynamite has

Heat used—Air: 7,500 cu. ft. × 0.028317 cbm.=212.4 cbm. minutes.

212.4 cbm. min. × 0.2375 (284°–19° C.) × 1,440 min. = 12,247,904 kg. Calories.

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With coal or oil fuel, the absolute efficiency would probably exceed 85%. The 19,247,904 kg. Cal. would equal 2,406 kg. coke with a calorific value of 8,000 kg. Cal. or 2.65 tons (at 2,000 lb.). The price of coke delivered at the smelter was $21 per ton, or for 2.65 tons, $55.65. The operation of the hot-blast stove cost $38 per 24 hr. This leaves, in favor of hot blast, $17.65.

In the price of coke, weighing and charging are not included. The cost of heating the blast, with hot-blast stove maintenance, was 25c. per ton of charge smelted. The cost of using coke in the blast furnace and figuring on a thermal efficiency of 100% would have amounted to 37c. per ton.

The amount of $17.65 only measures the commercial gain in using heated air instead of coke. It must also be remembered that the thermal efficiency of shaft furnaces (where material to be heated and fuel to be burned are in direct contact) is from 30 to 50% only; the air would be used with a greater thermal efficiency than coke with the same number of heat-units, so that $17.65 does not represent the entire gain; that is, the higher temperature obtained at the tuyeres by the use of heated air, with accompanying higher re-action powers between iron monoxide and silica means a more rapid oxidation of the iron sulphide.

COMPRESSED AIR can be conveyed in pipes for several miles and still be capable of performing useful, if not economical work. For the transmission of power, whether to rock-drills, pumps or hoists, it has the serious defect that heat is accumulated during its compression. The piston of the compressor must meet, not only the natural resistance of the air, but, in addition, that due to expansion arising from the heat of compression. Taking a cubic foot of air at 0° F., let us compress it to 58.8 lb. per sq. in.; the volume of air will be reduced to 0.3194 cu. ft. and its temperature will have risen to 309.4° F. The absolute need of taking in air to the compressors at as low a temperature as possible, and of cooling the compressing cylinder by the circulation of a constant stream of jacket-water, is evident from the above example.

Waste in Mining.

By SIDNEY J. JENNINGS.

*When men began to analyze the process of mining minerals from the earth, the great cost of preparing the excavations necessary for the purpose probably first impressed them. Some means were sought by which this cost could be reduced. Very soon there probably arose some man with the suggestion to do away with the excavations altogether, his argument probably being that the only necessity for large excavations was to enable men to get to the places where the ore was; that it would be much simpler to get some solvent that would selectively dissolve the desired material from the surrounding waste, and the enriched solution could be pumped to the surface, and there treated so as to separate the solvent from the dissolved commodity sought for. This idea proves wonderfully attractive to some men—all the more so because in certain cases it has been successful. Many salt mines are worked on this principle, and some copper mines under very special circumstances have used this idea, the solvent in these cases being water. I have also heard of one silver mine worked on this scheme, the solvent being hyposulphite of soda. Since the discovery of the solvent action of cyanide of potassium on gold, it was to be expected by anyone possessing any knowledge of human nature that the idea of treating gold ores *in situ* by cyanide of potassium would be suggested. But I must confess that I have been surprised by the number of times this idea has been brought before me and the different classes of men who have suggested it. The care and thought devoted to the perfection of the details of the schemes have been very great, while their essential difficulties have been forgotten in the enthusiasm fired by what their inventors conceived to be a new and great idea. While I am the last who would defend an idea merely because it is old, or who would seek to prevent the enquiry by new minds into old and apparently well-established practice, I think that you will agree with me in including all the energy expended on the above outlined idea in the category of wasted thought.

Situated as most metalliferous mines are, far away from stir of cities and the crowding of men, the administration of a mine tends to become that of a one man show. This undoubtedly accentuates the individuality of the manager, makes him self-reliant and resourceful, but it also tends by that very accentuation of individuality to make him insist on doing things in his own way, without sufficient consideration whether that way is the best one possible. The very resourcefulness of a mine manager induces him to try all sorts of experiments which others have tried and tried again, and whose futility have been thoroughly demonstrated. These defects of the virtues of a mine manager are not so prominent when there is only one mine in a camp, but when, as in Johannesburg, you have over sixty producing mines, the subtle friction of mind upon mind produces all unconsciously to the individual an excitation which is apt to result in a series of experiments, the vast majority of which will have been tried before, and the resulting waste of thought will be great. Some years ago a mine manager boasted to me that he had never been over any other mine on the Rand except his own. His plant showed evidence of this. Some things were excellent, but many designs showed evidences of great ingenuity in doing things in a roundabout way—the same effect being accomplished on neighboring properties in a much simpler fashion.

One of the means adopted on the Rand to obviate this waste of thought has been the grouping of several mines

*An address delivered before the South African Association for the advancement of science at Kimberley. Abstracted from *South African Mines*.

under one central administration. While undoubtedly centralization when pushed to an extreme can have a deleterious effect in crushing out initiative and reducing the sense of responsibility of the manager, it has had, and when wisely administered will continue to have, a most beneficial effect in making the results of one experiment in any given direction, whether positive or negative, immediately available to all the members of the group, by aiding the manager in all his difficulties with the advice of another experienced and matured mind, thus substituting the deliberate judgment of two men for the possible rash acts of one. Centralization also allows the results achieved in any one department of a mine to be compared on a uniform basis with the results achieved in the same department on any other mine of the same group. Thus while centralization saves the waste of thought in experimenting and resolving problems already adequately disposed of, it promotes thought in showing what other men have achieved in the same line, for nothing gives cause for such quick and steady thinking as a comparison on a uniform basis which shows your own work in an unfavorable light. Centralized management has also other advantages which do not come within the range of our present consideration, and which, therefore, I will not deal with now. Undoubtedly it can be pushed to such an extreme that its evils outweigh its advantages. But these prejudicial effects are not inherent in the idea of centralization; they are mere excrescences which have been allowed to grow on the system, whereas the good that can be achieved by the system is an integral part of the idea on which it is founded. These inherent advantages give the centralized system a vitality by means of which it must survive any surgical operation, however heroic it may be, necessary to cut away its abuses.

Here in South Africa, where the division between laborer and overseer is so sharply accentuated by the color line, where the Kaffir forms such an exceptionally powerful muscular machine, and at the same time is supposed to be so relatively cheap, the temptation to waste labor is tremendous, and is, I am afraid, not always successfully combatted. Not only does this waste of labor comprise the relatively cheap Kaffir, but extends to the much more highly paid overseer; for if laborers are employed in too great numbers on any given piece of work, the cost of supervision must in proportion be unduly inflated. Viewed as a source of human energy, the Kaffir stands high in the scale of laboring people, but from the facts that relative to his wants his remuneration is enormous, and that his sense of responsibility is very inadequately aroused, it is difficult to train him to be as efficient a workman as he is seemingly capable of becoming.

As far as the routine surface work on the mines of the Witwatersrand is concerned, their managers claim, and I think with justice, that the waste of labor has been reduced enormously since the opening of these fields, and that the margin for further reduction in this direction is very small. As an example of what has been done, I would instance the fact that the number of employees in a certain 100-stamp mill with crushers, in the year 1890, was 28 white men and 121 natives; this mill crushed under 5,000 tons a month. At the present time a 100-stamp mill, crushing 14,000 tons of ore a month, will only employ 11 white men and 27 natives—showing that the labor, measured by the tons crushed, has been made eleven times as effective. I have seen, as doubtless many of you have also seen, Kaffirs who looked on a shovel for the first time, and whose conception of its use was limited to placing it on the ground, carefully filling it with ground scooped up in his hands, triumphantly placing it on the top of his head, then bearing it off to the spot to which the ground had to be shifted. And I have also seen Kaffirs who were able in a day to load 40 tons of sand into trucks, and shift them 40 feet, a task which would be considered excellent work anywhere in the world. If the labor force of any industrial venture is largely composed of men like the first mentioned, a huge waste of labor will for a time be the result, whereas if any large proportion can accomplish similar work to that of the second set of workers, then the manager of such an enterprise can view an inspection of his labor sheets with equanimity and unconcern.

While undoubtedly an enormous amount has been accomplished in reducing the waste of labor on the mines of the Witwatersrand, we still have to acknowledge that enough remains to be done to engage the serious attention of those who have the interest of these mines at heart. Personally I am no great believer in what has been called 'dramatic economy of labor.' Under such an impulse, the interest on the capital necessary to be spent in order to save the labor of one man, is apt to exceed the wages which would have to be paid that man. I am, however, a great believer in the slow, laborious, but permanent effect of education on the laborer. Catch the Kaffir young, educate him so that he knows how to work, instil in him sufficient ambition and enough wants to make it necessary for him to work continuously in order to satisfy them, then that very necessity for continuous labor will draw out and increase his sense of responsibility so that he can be trusted to do his work properly without the excessive and wasteful supervision now necessary. Also educate the overseer to realize that he is a foreman of a gang of laborers whom he has to train to work to the best advantage, and, this accomplished, you will have probably reduced the wastage of labor to the minimum possible under South African conditions.

In considering the third kind of waste in mining, that of material, the subject divides itself naturally into two sub-heads:

1. The waste of the mineral sought for.
2. The waste of minerals used in the process of acquiring the mineral.

On the Witwatersrand enormous strides have been made in reducing the first-named waste. In 1891, on one of the better managed companies of these fields, a close inspection of the gold returns showed that only 57% of the assay value of the ore was recovered. In other words, for every sovereign's worth of gold contained in the ore treated only 11s. 5d. worth were recovered; whereas under the latest metallurgical practice on these fields by the use of tube-mills 95% of the assay value of the ore has been banked. This means that out of every sovereign's worth of gold contained in the ore treated, 19s. were put into the bank. Of course the difference between 11s. 5d. and 20s. was not all lost. A large portion of this difference was contained in the tailing which was stored and treated in subsequent years. None the less an immense advance in metallurgical practice has been made; so great indeed has this advance been that on the best equipped mines little remains to be done in the direction of reducing waste of the commodity sought for. The ingenuity of the engineer is exercised in bringing older plants into line with the newest practice at the least cost for capital expenditure.

The waste of stores used on the gold mines of the Transvaal has been great in the past, and continues at an excessive figure. This is a case where the directing brain is practically at the mercy of the performing hands. Large reductions have been made in the cost of coal, explosives, cyanide and candles, which form the four largest items of expenditure of the gold mines. In the case of coal this reduction has been achieved by decreasing the railway rates, and also by a slight reduction in the price at the pit's mouth. The cost of dynamite has

been reduced nearly one half through the freeing of the country from the grip of the former monopoly. Through improvements in manufacture and by the competition of manufacturers, the cost of both cyanide and candles per unit consumed has been greatly reduced. As far as coal and cyanide are concerned a close supervision of their consumption has taken place, and continues to occupy much of the energies of the engineering and metallurgical talent in the Witwatersrand. I estimate that if all the plants could be run with as small a consumption of coal per ton of ore crushed as the most economical plant uses, then the consumption of coal would be reduced by about one third of the present amount. While it is out of the question, owing to the heterogeneous design of many of the plants, to expect any such saving to be made, a great improvement can still take place, and undoubtedly will gradually be brought about.

The directors of the mining industry have made a long, determined, and serious effort to diminish the waste of explosives, candles, and other stores used underground, by paying the men by the results obtained. Some improvement has taken place, but to many observers it seems that an even greater improvement would ensue provided the intelligent and loyal co-operation of all the men were continuously secured.

Tin in the United States.

The United States Geological Survey has published a report on the present status of tin mining :

During the year 1905 there was no actual production of metallic tin in the United States, the only ore production being an insignificant quantity from the placers of Buck creek, Alaska. There was no output from the lode claims of the York region, Alaska ; none from South Carolina, although 38 tons had been washed from the residual placers at Gaffney, in the northern part of that State, in 1904 ; nor was any production reported from the Black Hills region of South Dakota and Wyoming.

In Alaska the season was exceedingly bad, so that sluicing on Buck creek was carried on with great difficulty, and this, together with other reasons, resulted in a small showing for the year's work. However, the first really good prospects on Cape Prince of Wales were found during the year, and the possibility of future production is not without hope. There was prospecting in the Lost River valley of the York region, where larger quantities of tin ore were shown to be present than had been known, and small veins were found at several points in the vicinity of the original discovery. Small veins of cassiterite-bearing quartz were found in the slates around the head of Buck creek, and small stringers of cassiterite were also found in granitic intrusions. These, however, hold no great promise as to future production. From Ears mountain, 40 miles east of Cape Prince of Wales, specimens of supposed tin-bearing rock have been brought by a number of parties ; but although tin ore has undoubtedly been found there, the minerals taken for cassiterite are, more often than otherwise, either tourmaline or augite. What the extent of the deposits may be is wholly unknown. Some stream tin has been found in the creeks heading on the mountain.

Prospecting for stream tin has been carried on, and has shown cassiterite to exist in variable quantities in many of the small streams flowing into Lopp's Lagoon, but in most of these streams it would be difficult to get sufficient water for sluicing. Good prospects are reported as being found in Grouse creek, below the mouth of Buck creek. Small quantities of stream tin have been found in a number of other creeks of Seward Peninsula, but nothing so far shown warrants the statement heralded in glowing prospectuses that there is "tin enough in sight to supply the world."

In the Black Hills some prospecting was carried on in both South Dakota and Wyoming, and a small experimental mill was erected at Etta mine. It is hoped that there will be some output during the present year.*

In the South Carolina-North Carolina region, although there was no output, much prospecting and development work has been carried on, especially at King's Mountain and Lincolnton. At the former place a mill with rolls, jigs and tables was erected ; several shafts were sunk to a depth of 40 to 50 ft., and prospecting is being carried on on the old Ledoux properties south of the town. Some concentrate has been obtained. At the Jones mine, 7½ miles north of the town of King's Mountain, a small roll-mill with two Bartlett tables was erected, and a little concentrate was turned out. Some very promising ore has been struck, and prospecting is being done at the 100-ft. level. About a mile and a half north of Lincolnton, N. C., extensive prospecting has been carried on, a large number of surface trenches have been dug, some hundreds of feet of drifts driven, and rich ore has been uncovered at a number of places. At the Ross mine, about a mile north of Gaffney, S. C., and but a few miles below the North Carolina State line, a hoisting engine and a pump have been installed and a shaft 121 ft. deep has been sunk. Several hundred feet of drifts have been run on the 65 and 95 ft. levels. A number of tons of ore are upon the dump ready for treatment, and a small quantity has been washed in sluice-boxes. The country rock and gangue here is greatly decayed.

At the El Paso, Texas, deposits there have been no notable developments. In California some prospecting is said to have been carried on at the old Temescal mines and near Santa Ana, but there has been no resulting production during the year. No new occurrences of tin are known to have been found in the United States in 1905.

Although complete figures of the output of tin in foreign countries are not at present available, it is possible to give what is belived to be a very close approximation, as follows : Malay States, 65,565 net tons ; Bolivia, 13,646 tons ; Banka, 11,155 tons ; Cornwall, 5,040 tons ; Australia, 5,028 tons ; Billiton, 2,715 tons ; total, 103,149 tons. This total is about the same as that of 1904, which was 103,134 net tons, the difference between the two not being as large as the probable errors in the figures.

MEASURING FLOW OF AN ARTESIAN WELL.—Under conditions where a weir could not be built, a novel way of measuring the flow of an artesian well was devised. Forty feet of 10-in. pipe was screwed into a 90° elbow on the pipe where it came out of the ground, and a hand force-pump attached to a small hole tapped into this pipe. The force-pump drew a red analine liquid from a pail and injected it into the stream, where it was carried along with the water and at the same rate. By means of a stop-wetch and the known carrying capacity of the pipe the flow of the well was easily determined.

CHARLES DARWIN abhorred mere speculation as nature abhors a vacuum. He was as greedy of cases and precedents as any constitutional lawyer, and all the principles he laid down were capable of being brought to the test of observation and experiment.

*There has been more recent activity in the tin-mining industry in the Black Hills than is indicated in the above paragraph, referring to South Dakota and Wyoming. A large concentrating mill was built at the Etta mine in 1885, which was abandoned after a brief run owing to small amount of ore available, but a new experimental plant has recently been built at the Gertie mine, near Hill City. At Tinton in Lawrence county, the Tinton Company has a testing mill which has been operated from time to time, testing the ore from the various mines of the company. In southern California some prospecting was done last year by lessees at the Cajalco mine, of the San Jacinto Estate Co., near Corona.—Editor.

Ramsey, Nevada.

The newest mining town in that land of the fortune hunters, Nevada, is called Ramsey. It lies on the north slope of Alamo mountain, at the head of Morgan cañon and is reached from Churchill by stage, distant 15 miles. It is 25 miles northeast from Virginia City. Already, at least one man has been shot in a dispute over claims, and Ramsey is now a full-fledged camp, growing at a lively rate. It is the result of the discovery of gold by the Ramsey brothers in the neighboring mountain early in the present year. To reward themselves for their discovery the Ramsey boys, it is said, staked 150 claims, a thing legally possible but not altogether popular with others who in these days are eagerly watching the course of events in Nevada, and sleeping with one eye open. Everyone is on the alert and ready at a moment's notice to 'roll their blankets' and 'hit the trail,' for any new discovery that may be announced, no matter how far distant or how inaccessible. The past year has seen these new pioneers of the sagebrush State rushing hither and thither, across its deserts and mountains, acting promptly upon the slightest hint and sometimes on the merest rumor, of a new strike—fearing to be too late to secure a claim. The announcement of a new and rich find is the signal for a rush, as proved at Manhattan, Fairview, Buckskin, Seven Troughs, and others, and now Ramsey. However prompt the adventurous pilgrim—be he prospector, promoter, capitalist, or miner, he usually finds a townsite surveyed and staked, with lots temptingly ready for the investment of his spare cash—if he has any. The first building, or more often tent, to go up on the new townsite, is usually occupied as a saloon, the next by newspapers—the miner sometimes coming third in the race.

The new-comer early in the rush sets up his tent and taking his pick and canteen strikes out at daylight into the hills to find the rich mine of which he has dreamed, but he is unusually fortunate if he can find a vacant piece of ground that he may locate, without interference on the part of the more boisterous element. When he returns at nightfall he has difficulty in finding his camp. The half-dozen brush-shacks and tents he left in the morning have suddenly multiplied into scores of tents and instead of a dozen rough prospectors he is likely to find hundreds of men, many in 'boiled shirts' and 'store clothes,' and to see big automobiles wheeling clumsily over clumps of sage-brush and mounds of sand in the newly laid-out streets. Lots have gone up too, and the reports of rich strikes are heard and repeated on every side. Rough-looking old prospectors, miners, young fellows, seemingly store clerks, and even women, trudge into camp at nightfall, their pockets bulging with rock, some of which glitters with golden scales—of mica. Others, more wise, have the real thing, but make no haste to tell where they got it, and the excitement grows apace.

In the last days of July, Ramsey consisted of nearly 100 tents, three wooden buildings, and a few shacks built of brush, gunny sacks and old tin cans. Eight saloons aided in giving the place a metropolitan air. There was also the townsite office; two lodging-houses were contemplated and two restaurants were running night and day.

A writer on the ground says Ramsey has the biggest surface showing of any camp in the State. The veins of the district are big and strong, and they should go down



Ramsey as It was on August 1st.



Saloon and Newspaper Office.



The Croppings of the Lucky Boy.



Sharpening a Drill.

to great depths. One of the principal mining companies is the Ramsey Comstock. Several days ago 20 men began sinking a three-compartment shaft on the foot-wall of the Clark dike. Other shafts are being sunk as fast as possible. Another paragrapher in mining-camp phraseology writes: "A 20-in. streak of 'lousy' rich ore was found on the Brennan No. 2 Wednesday afternoon. Two pounds of ore was pounded up in a mortar, and retorted in a forge. The button weighed, rough, about $6.50, and the assayer called it worth $5.50 when he got it. The ore, therefore, at the place where the sample was taken is worth $5,500 per ton."

In reading reports of this character the experienced mentally make the necessary discount as a sort of factor for safety in contemplating the over-enthusiasm of the news purveyor.

The accompanying illustrations give an idea of how Nevada's newest bonanza camp appeared about two weeks ago—it is no indication that it looks the same today, for it has had a chance to grow. One photograph shows the leading smith of the camp hard at work sharpening drills for prospectors. Another shows the office of the *Recorder*, the first newspaper in camp; a third illustrates only a portion of the lively town and the fourth gives a glimpse of the outcrop on the Lucky Boy claim.

The Essence of Crystalhood.

By HENRY M. HOWE.

*Assume a case of an initially perfect octahedron growing within a supersaturated solution. This octahedron is an organized being. Just as the surface of the intestine of an animal has the power of selecting, from the food presented to it, those substances required for the nourishment and the growth of the animal; the power of absorbing them, of assimilating them, and of rejecting all other matter; and just as the animal is sustained and grows through the selective, absorptive, assimilative and rejective power of the surface of its intestines, precisely so the crystal is armed with surfaces which have the power of selecting from the liquid in which it is immersed those molecules necessary to its growth (namely, molecules of matter like to itself) of absorbing those particles, of assimilating, that is, of polarizing and arranging them in a definite manner about its own structure; and finally of rejecting all foreign molecules. These faces thus have the power of selection, absorption, assimilation (that is, polarization and arrangement according to the structural needs of the organism) and rejection, exactly like the digestive and assimilating powers of the animal. Therefore I say that the crystal is an organized being, and that each crystal and detached crystalline grain is a separate and definite organization.

Suppose that our octahedron now keeps on growing, maintaining itself as a perfect octahedron, until it has grown to such a size that certain mechanical barriers, which it meets within the liquid, interfere with its further growth, and that further assimilation of matter is now unable, because of mechanical obstruction, to preserve the strict octahedral form. The form then which had been geometrical up to the time when this mechanical interference occurred now ceases to be geometrical. The object ceases to be a perfect octahedron, but does it cease to be a crystal? Are we to suppose that this organized being continues to be a crystal up to the moment of this outside mechanical interference, but that its further growth makes it cease to be a crystal? Is it not a more workable, a more reasonable scheme to hold that it remains a crystal, a deformed crystal, if you please, but still a crystal? The Chinese woman's foot, deformed by restraint, remains a foot, a deformed foot, if you please, but still a foot.

Let us take another case. Our assumed perfect octahedron is removed and its angles are ground off slightly by mechanical means. If the grinding be very slight, it clearly remains a crystal. If we continue the grinding and deface it more and more without breaking it up, the question is: Do we make it a deformed and defaced crystal, or does it become, as the definition of Osmond implies, only a crystalline fragment? Let us assume that we grind off from the face of such a crystal 10% of its matter, enough to destroy its geometrical shape completely. Are the remaining 90% crystal or not? Should we not say that they are mutilated crystal, but still a crystal?

The case is essentially different from that of a statue, a cube or even a man, and really goes beyond even that of a book. Statue-hood and cube-hood depend exclusively upon external form and absolutely upon nothing else. I knock off the nose of a statue, and while the nose becomes a fragment, the body remains a statue. I proceed to knock off the arms and legs, and soon the statue ceases to be a statue and becomes a fragment; for, since statue-hood depends exclusively upon external form, relatively slight mutilation suffices to change a statue into a fragment. In the case of a man we carry the destruction much farther before manhood ceases, because manhood depends directly on life, and only indirectly upon external form as necessary to life; we can cut off both arms and both legs, and if life continues, the man remains a man, and is not a fragment merely.

In case of a book, however, mutilation can go much further without destroying book-hood. We tear the covers off a book and it remains a book, the very same book, because book-hood is not essentially dependent on external form. May we not say the same of a crystal—that external form is not essential to crystal-hood? In crystal-hood as in book-hood is not the interior far more essential than the external form? But is not the essentialness of internal organization true, *a fortiori* of crystal-hood, since the internal organization is the generator of outward symmetry, and will reproduce it, if the permissive condition, immersion in a suitable solution, exists?

*The *Metallographist*, Vol. V, 1902.

ILLINOIS COALFIELDS.—The work of the State Geological Survey on the coalfields of Illinois is going rapidly forward. A large number of mines already have been visited, and careful samples taken for laboratory study; 160 such samples being now on hand. Director Bain recently visited the Livingston and La Salle county fields, preparatory to making careful surveys. J. A. Udden is now engaged in working out the faults near Peoria which have been such a constant source of annoyance and expense to operators in that vicinity. T. E. Savage is making a detailed study of the Springfield mines. J. J. Rutledge has taken up an investigation of the coals of the East St. Louis-Belleville area, and F. W. DeWolf is about to begin work in Saline and Gallatin counties. His work, as also that of David White, who is making collections of fossil plants throughout the field, is carried on by the U. S. Geological Survey in co-operation with that of the State. Topographic surveys preparatory to next season's work are being carried on near Harrisburg, Marion, Herrin, Murphysboro, Trenton, Edwardsville, Alton, and Tallua. A preliminary report upon the composition and character of Illinois coals is in press.

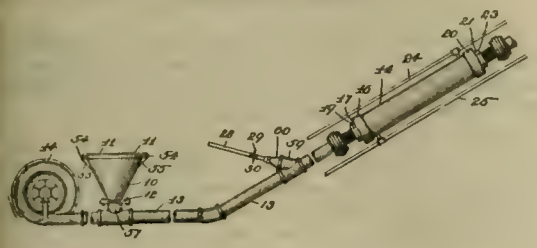
GOLD AMALGAM tightly squeezed usually contains about one-third gold, but there is a wide range in the composition of amalgam.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

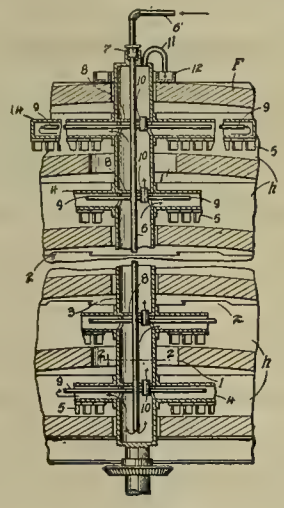
APPARATUS FOR COOLING ORE.—No. 827,057; Henry F. Campbell, Melrose, Mass., and David H. Campbell and Thomas H. Smith, Denver, Colorado.

In an apparatus for conveying and cooling ore, the combination of units each consisting of a central conductor, a jacket inclosing the same, means for causing a circulation of water through said jacket, said central conductor having its ends provided with couplings, and said jacket consisting of a cylinder and circular nuts forming heads thereof connected together by annular screw-threaded rings.



ROASTING-FURNACE.—No. 825,326; Frank Klepetko, New York.

In a rabble apparatus, a hollow shaft divided into a series of compartments, hollow arms leading therefrom, means for introducing circulating medium into a compartment and into the arms leading therefrom, and conduits confined within the arms and establishing communication with a contiguous compartment through the partition-wall separating the compartments, whereby the cooling medium in the arms leading from any compartment is conveyed to the next compartment of the series.



APPARATUS FOR ELECTROSTATIC SEPARATION.—No. 827,116; Greenleaf W. Pickard, Amesbury, Massachusetts.

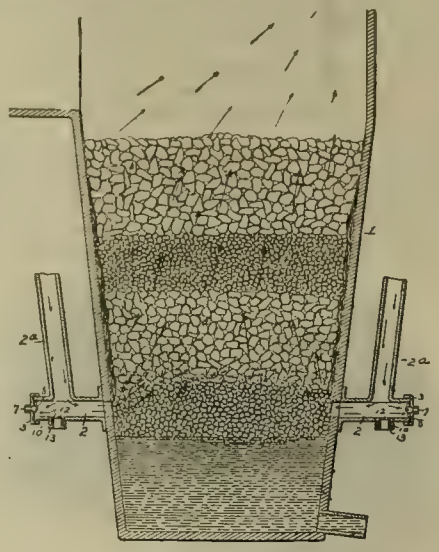
In an electrostatic separator, a source of electrical energy, electrodes, means to supply material thereto, means to heat the material before it reaches the electrode, and means to maintain a heated atmosphere about the electrode into contact with which the material is delivered.

ORE STAMP-MILL.—No. 828,126; Thomas E. Lambert, Butte, Montana.

A stamp mill, comprising one or more vertical stems, having shoes at the lower ends thereof, dies co-operating with the shoes, tappets on the stems, a shaft, and cams thereon for engaging with the tappets, coiled springs on the stems, upper and lower guides for the stems, and means for preventing contact of the coils of the springs with said stems, embodying flanged collars upon the tappets, and similar flanged collars at the upper ends of the springs, the said collars extending within upper and lower coils of the springs.

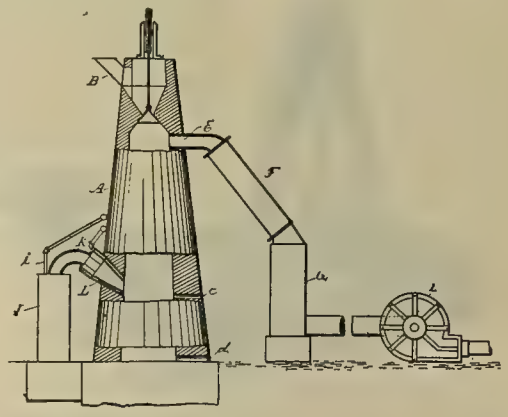
BLAST-FURNACE TUYERE.—No. 826,715; Thomas Evans, Great Falls, Montana.

1. A tuyere for blast-furnaces constructed with an opening in its bottom, a destructible disk normally closing said opening, a removable cap closing the outer end of the tuyere, said cap having an opening and a valve pivotally attached to the inside of the removable cap.



PROCESS OF REDUCING METALS.—No 826,557; George L. Fogler, Pittsburg, Pennsylvania.

Continuous proces of smelting ores which consists in forcing previously heated reducing gases into a reduction zone maintained in the ore, furnishing a supply of air insufficient to effect complete combustion around the gas supply whereby the incompletely burning gases reduce the ores, maintaining a partial vacuum above the charge whereby the gaseous products of the incomplete combustion and of the reduction expand into the upper portion of the charge and rapidly leave the reduction zone; continuously maintaining the reducing atmosphere in the furnace, drawing off the products of the smelting process and supplying fresh ore and flux from time to time.



ROCK-DRILL.—No. 828,684; John E. Sales, Wrangell, Alaska.

In a rock-drill, a car, a turn-table on the car, a main frame pivoted to the turn-table, means for adjusting said frame, a secondary frame pivoted in the main frame to swing in a plane at right angles to the plane of movement of the said frame, means for adjusting the secondary from a supporting-bar pivoted in the secondary frame to swing in a plane at right angles to the plane of movement of the secondary frame, said bar carrying guide-rods, means for adjusting the supporting-bar, a motor mounted to slide on the guide-rods of the supporting-bar, and means for sliding the motors on said bars.

Single-Lift Centrifugal Pumps.

Where, in stamp-milling or in concentration, water has to be used over again, the heaviest portion of its contained slime is deposited in the settling pond, the remaining water being, however, by no means clean. Such water, charged with fine mineral matter, makes much trouble with piston pumps, so that the centrifugal pump, containing, as it does, no valves, is especially valuable. These pumps, when single, make a lift no greater than 40 to 50 ft., and, in no case, should have to suck more than 20 ft. vertically. Fig. 1 represents such a pump, having a horizontal spindle or shaft, and Fig. 2 one having a vertical spindle, the pump itself being submerged.

Care must be taken, where, as in Fig. 1, a suction-pipe is used, that its joints and the stuffing-box gland around the shaft is perfectly air tight. To keep grit out of the stuffing-box a clear water-supply pipe under a head is often connected to it. This tends to keep grit out of the gland. The

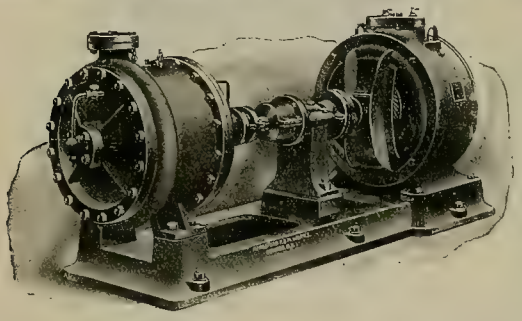


Fig. 1. Kingsford Centrifugal Pump.

suction-pipe is fitted with a strainer and a foot-valve, which prevents the backward flow of the water when the pump comes to rest. The soundness of these joints is best tested by allowing the pump to stand for a short time with the pipes full of water, when, with a tight foot-valve, if leakage exists, it will show itself. When the water, which is to be raised, is below the centre of the pump-spindle, the pump must be charged or primed before it can deliver any water.



Fig. 2. Goulds Centrifugal Pump.

This is done by filling the suction-pipe and pump-case full of water while the pump is at rest, to, at least, as many inches above the top of the case as there are feet of suction below it. For this purpose a valve and funnel are fitted, either to the top of the casing, or to the foot of the standpipe. Often a pet-cock is placed at the top of the case to be opened in order to know whether the pump is running.

Where it is desired to raise the unsettled watery slime or pulp, this can be effected by submerging the pump. Its speed should then be so adjusted as to take the supply as it arrives without giving it time to settle, nor should it lift a greater quantity than this, since then the sump would be emptied and the pump would become choked with slime, due to the fact that there would be no rush of water to carry off the thick mud.

Considering the rough work they are put to, and the gritty nature of the stuff handled, the wear is not excessive. The interior is lined with hard plates which are renewed, as they wear out, from spare parts kept in stock. The spindle and the runner, or impeller, also wear, and have to be renewed in the same way. Centrifugal pumps of this type give excellent service and are much in demand for cyanide plants and concentrators.

Trade Treatises.

THE WELLMAN-SEAVER-MORGAN CO., of Cleveland, Ohio, has issued circular No. H.O.-7, on high-grade geared hoisting engines. As usual with its publications, it is beautifully printed and handsomely illustrated.

THE HENDRIE & BOLTHOFF MANUFACTURING & SUPPLY CO., of Denver, Colo., has issued a little pamphlet descriptive of the hydro-electric power plant of the Nevada Power Mining & Milling Co., on Bishop creek, Cal. The details are interesting and instructive.

Mine and Quarry for August, issued by the SULLIVAN MACHINERY CO., of Chicago, contains the usual amount of readable and valuable practical information. The features of the August number are The Gunnison Colorado Tunnel; Channeling in New York City, and Quarrying Sandstone at Amherst, Ohio.

THE CYCLONE DRILL CO., of Oroville, Ohio, has issued a book descriptive of its machinery and methods of operating. The Cyclone drill is a hollow-rod device used in sinking wells and in prospecting for minerals in either solid rock or fragmental material such as wash gravel.

Commercial Paragraphs.

ROBERT H. RICHARDS has returned to Boston, after a visit to Denver and Chicago, where he has made arrangements for manufacturing his classifiers.

THE DE LA VERGNE MACHINE CO., of East 138th St., New York, reports nine recent orders received for Hornsby-Akroyd oil engines, aggregating 245 horsepower.

J. M. BROUCHER has resigned from the employ of the Brownell Co. of Dayton, Ohio, to act as assistant general manager of Sales for the Atlas Engine Works of Indianapolis.

M. P. BOSS has associated himself with the Norris K. Davis Machine Co., 7th and Harrison St., San Francisco, who will manufacture his standard crushing and milling machinery.

HOWARD E. TROUTMAN has resigned from the Buckeye Engineering Co. to accept the sales management of the Corliss and high-speed engine department of the Atlas Engine Works of Indianapolis, Indiana.

THE annual report of the WESTINGHOUSE ELECTRIC & MANUFACTURING CO. for the year ending March 31, 1906, shows the enormous volume of business done by this enterprising firm. It employs directly in the conduct of its business nearly 15,000 people, not including the selling organization. The report shows the business done by this concern now amounts to about $35,000,000 annually, with proportional profit, dividends for six years ending March 31, 1906, having been $9,922,069 with a surplus on hand of over $11,000,000.

THE BUFFALO FORGE CO., of Buffalo, N. Y., has recently closed a large contract with the Bethlehem Steel Co. for forced draft equipment, consisting of six fans and engines (direct-connected) to drive the same. There is included in the contract, provision for complete accessories in the line of dampers, speed regulating valves, piping, ducts, etc. They report the contract as secured, solely on the engineering merits of the apparatus offered, several other companies submitting proposals with lower bids.

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Editorial.

THE FATEFUL 16th of September has come and gone without a revolution in Mexico. It may be that the orders of President Diaz to close all the saloons during the *fiesta* dried the enthusiasm of the gentlemen to whom Mr. W. R. Hearst has given so much needless notoriety; it may be that the *rurales* put the fear of the Lord into the *pemes;* in any event, it is a matter for satisfaction that the date has passed without any trouble.

AN UNEXPECTED ASSOCIATION of ideas is provoked by the contribution of Mr. A. E. Drucker on 'Tube-Milling in Korea.' The hermit kingdom has stood so long for the type of all that is unprogressive that it upsets our notions to learn of a new development in cyanidation as originating there. However, the new ideas are not indigenous; they come from the Americans who have made the Oriental mines at Taracol one of the most successful enterprises in eastern Asia. The use of cyanide solution in the tube-mill parallels the use of cyanide in battery water. Mr. Drucker appears to have made a success and it remains to be seen whether the method will survive. In stamp-milling, the use of cyanide in the battery is now uncommon. In many cases it has been found that the chemical exerts a selective solvent action on the gold in the amalgam and actually precipitates silver on the copper plates; if the solution exceeds 0.005 KCy it is apt to attack the copper and give the plates a bad surface.

THE WRITER on 'A Confusion of Terms' has done well in hiding his identity under a pseudonym, for his vigorous onslaught is calculated to cause trouble. His objection to the use of certain appellations is in line with the discussion on 'Who Is a Mining Engineer?'—a question concerning which we hope to say something when others have expressed their views. As to 'mining man,' 'cyanide man,' and the rest of it, the choice of terms must remain a question of taste and the want of it — especially the latter. A French proverb says: Each to his taste and the merchant sells everything. It is not for us to teach the public in matters like these. Among professional men there is a dislike of the term 'expert,' because it has been stolen by masqueraders in the serio-comedy of mine promotion. 'Mining man' covers a multitude of energetic citizens and has ceased to be distinctive. As to 'cyanide man,' that certainly is no synonym for metallurgist, and so long as it describes the operator of the cyanide annex, there is no harm done. People chose their own labels. We are reminded of the man who, having acquired the title of 'professor' by no academic route, explained that when all was said and done, a professor was a man who professed to be — a professor. The meeting adjourned.

Ore Stealing.

Provoked by the hasty criticism of a visiting journalist, the Chamber of Mines of Western Australia has placed on record its views on the methods applied to suppress gold stealing and the illicit trade incidental to such thefts. The rich mines at Kalgoorlie have lost heavily from this cause, as was the case at Cripple Creek when much specimen ore was being mined; it is one of the penalties incidental to the exploitation of lodes containing visible gold or those lustrous tellurides that attract a covetous hand. Despite a diminution in the issue of gold-dealers' licenses, the passage of laws containing severe provisions against both thief and receiver, the vigilance of the police, and the precautions of the mine management, this evil has persisted in serious proportions. Two factors have prevented the suppression of stealing; the first is the notion even among miners who are otherwise honest that there is no harm in annexing a specimen; the second is the spurious sentimentality of the public, which will condone the offense and, in cases of prosecution, is inclined to side with the accused, so that a perverting influence is exerted on magistrates and juries. This general tolerance, to be noticed in most mining camps, originates in self-interest. Those who make money by the illicit traffic, spend it freely, especially in the saloons and gambling houses. They spend it on the spot and help local trade. Hence the undercurrent of sympathy with both the thief and the receiver. At Kalgoorlie, as at Cripple Creek, there have been many perversions of justice; again and again prosecution has been brought and the theft fully demonstrated, and yet the accused has escaped through a legal technicality, the disagreement of the jury, or the absconding of the culprit from a bail disproportioned to the sum involved. At Cripple Creek we remember a judge who decided that ore stealing was not petty larceny, because mineral was real estate! Finally, in both the mining districts mentioned, it became apparent that the root of the evil lay in the existence of a ring of receivers who masqueraded as assayers; in Colorado they are called 'fences'—an old term for receivers of stolen goods. At Cripple Creek these establishments were dynamited—by persons unknown—during the troublous days of labor disturbances. This was a wrong way of getting rid of them, because dynamiting is worse than ore stealing. At Kalgoorlie the withdrawal of gold-buyers' licenses and the activity of the police were largely successful in driving away the dealers in stolen ore, and with their withdrawal the illicit trade languished. But it appears to have revived through the leniency of the magistrates, who levy small fines instead of prescribing imprisonment. Even the penalty of six months in jail will not deter the confirmed thief, who will risk it for big plunder. So the Chamber of Mines asks for heavier punishments, denial of bail, and the issue of search warrants. As it is now, legal proof of the receipt of stolen mineral or pilfered gold-slime from the zinc-boxes in the cyanide plant is difficult to get, even when men are known to be doing a business in these things. To circumvent the law, it is the practice at Kalgoorlie to use two devices—the adulterated purchase and the dummy lease. Small lots of slag, furnace products, or dump ore are bought, with their value unspecified, and a receipt is obtained. This truck is mixed with specimen ore, concentrate, or gold-slime, and the mixture is put through the pretense of metallurgical treatment. The other scheme is to get a lease on a mining claim and add the stolen stuff to worthless ore, the result being credited to a mine from which it did not come. The Chamber of Mines demands that all reduction works and treatment plants be licensed, and compelled to keep accounts recording their transactions, these to be open to the inspection of detective officers. Finally, it is claimed that a special branch of the police department should be organized to attend solely to gold-stealing. All of which is, in the main, reasonable. Any restrictions or regulations that do not hinder honest men ought to be welcomed. One of the worst aspects of ore stealing is the development of queer notions of property and the palliation of crime. If this form of larceny is made increasingly difficult, the whole standard of honesty in mining communities will be the better for it.

Change-Houses.

There is reason to believe that the strike at Goldfield was due, not to the ostensible cause, but to the recognition on the part of the mine owners and lessees that the stealing of ore is depriving them of an undue proportion of their profits. 'High-grading' is the term applied to the larceny of gold ore; it is a term that was brought to Nevada from Cripple Creek, whence also came some of the restless spirits who are never happy unless there is a quarrel between those who provide the capital for mining operations on the one hand and those who supply the equally necessary muscle on the other. It has become obvious to the men who are exploiting the wonderfully rich veins of this new gold district that a stop must be put to the pilfering that is rampant throughout the camp and that, to do this, change-houses must be built and stripping made compulsory, as in other localities. No honest miner will object. It should be required of every company that it provide a comfortable and a sanitary building wherein the men can change their clothes on coming from underground. To discard clothing that is wet either with perspiration or mine water, to have a good wash or a shower bath, to dry the discarded garments and to put on street clothes, is surely an obviously sensible proceeding. For lack of such care, many miners get pneumonia. And if the working clothes are discarded in one room and the street clothes donned in another, there is a simple safeguard against stealing, while at the same time it affords a comfortable separation between those who are begrimed with the marks of toil and those about to go home in the garb of ordinary citizens. We know that the change-house has caused trouble more than once, but that has been when it threatened to stop the stealing of ore. At most mines, especially where the temperature at the surface differs much from that obtaining underground, the men recognize the need of such a convenience. It has the merit of serving two purposes—health and honesty.

By the Way.

DUTY ON ZINC ORE.—The Board of United States General Appraisers gave a second hearing recently in the test case brought by the Treasury Department in order to determine the classification of zinc ore for duty. The first hearing was given to the importers, represented chiefly by the New Jersey Zinc Co., and the second session was occupied by the representatives of mine-owners. The question was whether zinc ore is a metallic mineral substance subject to a duty of 20%, or whether it can be admitted free under the tariff provision 'for calamine.' It is a good example of the curious distinctions set up by those who frame tariffs. Axel O. Ihlseng, John R. Holmes, T. C. Molloy, and other witnesses united, in behalf of the mine-owners, in testifying that the zinc blende is a metallic mineral substance—which, at this distance, seems fairly obvious. The smelting interests claim that in the United States there is not enough zinc ore being produced to keep the furnaces running and that supplies must be secured from Mexico and British Columbia. The mine-owners assert that the smelters are using the spelter duty of 1½ cents per pound to force down the price of domestic zinc ore. Therefore they ask a low duty or a free entry for such ores, quoting the tariff provision for calamine. The case is under advisement.

THE COST OF LIVING.—The Bureau of Labor of the Department of Commerce and Labor, Washington, D. C., gives in its Bulletin No. 65, for July, 1906, an exhaustive presentation of the results of an investigation into wages and hours of labor in 1905 in the principal manufacturing and mechanical industries of the United States, taking identical establishments with those investigated in 1904. A summary of the results is as follows:

In 1905 the average wages per hour in the principal manufacturing and mechanical industries of the country were 1.6% higher than in 1904; the average hours of labor per week remained the same as in 1904, and 6.3% more persons were employed in the establishments investigated. As there was no reduction in the average hours of labor per week, the average weekly earnings per employee were 1.6% higher than in 1904. As there was an increase in the number of employees as well as in the weekly earnings per employee, there was a considerable increase in the weekly earnings of all employees, or, in other words, in the amount of the weekly payroll. This increase was 8% in the establishments investigated.

The retail prices of food, due weight being given to the quanty and cost of the different commodities consumed, were 0.6% higher in 1905 than in 1904. As the average wages per hour increased more than the retail prices of food, the purchasing power of wages increased. In 1905 the purchasing power of both hourly and weekly wages was 1% higher than in 1904, or, expressed in other words, an hour's wages in 1905 would purchase 1% more food than an hour's wages in 1904.

The average wages per hour in 1905 were 18.9% higher than the average for the ten-year period from 1890 to 1899, inclusive. The number of employees was 33.6% greater, and the average hours of labor per week were 4.1% lower. The average earnings per week in 1905 were 14% higher than than the average earnings per week during the ten years from 1890 to 1899. The aggregate weekly earnings of all employees—that is, the total amount of the payrolls—were 52.3% higher in 1905 than the average during the 10-year period named.

The retail price of the principal articles of food, weighted according to family consumption of the various articles, was 12.4% higher in 1905 than was the average price for the ten years from 1890 to 1899. Compared with the average for the same 10-year period, the purchasing power of an hour's wages in 1905 was 5.8% greater, and of a week's wages 1.4% greater, the increase in purchasing power of weekly wages being less than than the increase in purchasing power of hourly wages because of the reduction of the hours of labor during the period.

The average wages per hour in 1905 were 21.5% higher than in 1894, the year of lowest wages during the period covered, and weekly earnings were 16.7% higher. The purchasing power of an hour's wages was greater in 1905 than in any other year covered by this investigation, being 7.7% greater than in 1894, the year of lowest wages, and 1.3% greater than in 1896, the year of lowest retail prices. The purchasing power of a week's wages in 1905 was 3.5% greater than in 1894, but 2.7% less than in 1896.

We congratulate our esteemed contemporary, *The Iron Age*, on having won in the first trial of its case against the State of New York. The Labor Commissioner had informed the management that it was violating the law by employing females by night in the bindery; this appeared to be an unwarranted invasion of constitutional rights, so the publishers decided to test the law. The Court of Special Sessions decided in favor of the defendant publishers. There was no pretext that the building in which the women were at work was insecure, badly lighted, defectively ventilated, or unsanitary in any way; but by virtue of a factory law the commissioner claimed that the publishers were guilty of a misdemeanor in employing females or minors before 6 o'clock in the morning or after 9 o'clock at night. There was no issue of fact, the defendant simply pled that the law was unconstitutional, in that both the employer and employed were restricted in their rights; was this restriction within the constitutional power of the Legislature? The defendant invoked the provision of the State Constitution that says: "No person shall be deprived of life, liberty or property without due process of law." Was this factory law a health regulation in the interest of the common good, or was it it not plainly and palpably an unauthorized and unwarrantable interference with the constitutional rights of the citizen? The Court decided unanimously to this effect. The case is to be appealed, and we hope our friends will carry it to a final and successful issue.

NEXT to American capital, French capital has been the most active in seeking investment in Mexico during the past year. The proportionate increase of the French investment was greatly in excess of ours, being about 100 per cent. In less than one month after Mexico went upon a gold basis, Paris bankers had secured control of the banking situation of the country by acquiring a predominating interest in the leading banks of the City of Mexico, namely, the Bank of London & Mexico, considered the bulwark of British capital in Mexico, and the Central Bank, the clearing house for all the chartered State banks of the republic. French capital has for some years held a very large interest in the Natioual Bank of Mexico. Other French capital was invested in industrial enterprises, particularly in cotton mills and in mining undertakings.

THE ARTICLE on 'Useful Definitions' was to have appeared last week and we commented upon it at that time. However, the sound advice given by Mr. S. F. Emmons needs no recommendation, and our remarks in anticipation of the publication of the article were made in order to emphasize the fact that the hints he gives to the writers of the Geological Survey are applicable to those who perform the technical work of the mining engineer and metallurgist.

Special Correspondence.

Johannesburg, Transvaal.

Record Output for July.—The Cason Mine Comes to the Front.—Use of the Blaisdell Excavator.—Kaffirs and Coolies.—The New Constitution for the Transvaal.—Boom Days are Over.

The splendid record output for July has brightened things up a bit, even the market. The total output for the Transvaal has been declared at 491,793 oz., valued at £2,089,004. If all goes well it is quite possible that the August output will reach 500,000 oz. The increase of the July output over June is 15,818 oz. During July there were 7,705 stamps at work on the Rand, and 8,070 in the Transvaal. The most remarkable showing for the month is that of the Cason mine, one of the East Rand Proprietary group, which made its second declaration of 15,830 oz., an increase of 2,700 oz. on June. The Cason is now the third largest producer in the Transvaal. It is to be hoped that these excellent results will continue, and that the mine is not going through a 'show' period. A profit of £29,155 was declared for July. The New Modderfontein ran an additional 30 stamps during July. At this mine the Blaisdell excavator is used for emptying the cyanide vats, with good results. Should the scarcity of labor continue, it is probable that this contrivance will be introduced in several mills. Development is being pushed at the New Modderfontein, and during the last four months there were four tons developed for every ton milled. The three leading producers for July were Simmer & Jack (21,109 oz. output), Robinson (20,553 oz.), and Cason (15,830 ounces).

A number of new ventures were registered during July, principally diamond and 'base metal' syndicates. The promoters of most of the syndicates seem to be over optimistic about their ventures, especially those of the base metals. It would have to be rather a remarkable base-metal deposit to pay in the Transvaal under present conditions. There was one gold proposition registered during the month, namely the New Dupreeze Syndicate.

According to the *Rand Daily Mail*, there was a slight decrease in Kaffirs at work, about 562, and the total number now employed is 76,995. A second recruiting agency has been started, and we shall see if their boast that 50,000 additional Kaffirs can be recruited is mere talk or not. Personally, I believe that 80,000 Kaffirs is nearly the maximum that we can get to work continuously on the Rand. As regards Chinese, there are 52,203 available for the mines, July 31, 1906. The number of applications under the new notice of Liberal Government is not yet large. In a year's time the first batch of coolies will have completed their contracts. One of the leading deep-level mines for instance, will lose all its coolies (over 2,000) in August, 1907, unless they are allowed to sign on again. If the coolies go home, this mine will be forced to close down. Many other mines will be in the same fix. It is the uncertainty of the labor supply for the future that is causing the heavy depression. The constitution that has just been granted the Transvaal by the Liberals has not cheered things up very much. The general feeling is one of relief that the constitution has at last been granted. The Boers have the best of it, as they are united, while the British are split into several parties. It is more than probable that the Boers will dictate the policy of the first responsible government. They are not in love with the Chinese, but it is to be hoped that they will see the folly of re-patriating the coolies until other laborers are provided for the mines. The elections will probably come off not later than February next.

As already stated, the record July output brightened the market up a bit, but there is no reason for a rise in prices. The future is too uncertain to warrant a boom; in fact, boom days are probably over. People in Europe know fairly well now what the mines are worth, and it is not likely that they will be bluffed again into giving two or three times the value for Rand shares.

Leadville, Colorado.

Developments on Rock Hill.—Good Ore in the Louisville.—Revival at Kokomo.—Little Johnnie Resumes.

Work at the shaft on Frank W. Owers' property has been discontinued. The shaft had reached a depth of a little more than 700 ft. and entered the granite formation. After passing through several hundred feet of wash and lime clay, the shaft cut a 7-ft. layer of schist and entered the granite without cutting the productive ore formations. The information thus afforded will go far toward determining the probabilities of ore deposits on the western slope of Rock hill.

The New Monarch is at present taking out the richest ore in its history. The high-grade ore lies near the contact of a huge porphyry dike with the blue lime. The average of the recent shipments from this property has been of a better grade than that of former years.——The Reindeer, on Rock hill, is shipping from 80 to 100 tons per day. The ore now being hoisted comes from the 600-ft. level and southeast of the shaft. Prospecting is being carried on extensively in other parts of the property.

The installation of an electric hoist has been completed on the Louisville property. This hoist was installed at the Yak tunnel level and will operate through the old shaft to hoist ore from the new orebodies located by drill-holes. While data concerning the value of the new ore-shoots have not been given out for publication, the deposits are known to be extensive and of a shipping grade.——Regular shipments will start at an early date from the Robert E. Lee. The drifts are being repaired and extended, and a considerable quantity of ore is now exported.——The A. V., on Harrison Avenue, has secured a market for manganese ore. The output of the present month will amount to 500 to 600 tons.

The Delaware group of mines is soon to be re-opened. This property comprises the Colonel Sellers and Eagle in Ten Mile district. The group contains 250 acres and will be developed through an adit driven from the face of the mountain at a point much below the old workings. It is proposed to erect an 80-ton mill to treat the product of the mine. The character of the ore is lead, zinc, and iron sulphides, with low values in gold and silver.

The latest developments at the property of Judge W. H. Harrison, located in Lackawanna gulch, are creating considerable interest among mining men of this locality. It is reported that a large body of ore of an excellent grade has been opened up in the shaft. The new mill has been completed and will be put into operation as soon as transportation facilities are secured. The ore occurs in a true fissure vein and the present workings are located at an elevation of 13,000 ft.——The manager of the Emerald reports that shipping ore has been exposed at the breast of the tunnel. This property is located in Delmonico gulch.——The shaft of the old Raven property is being completely overhauled and a new plant of machinery will be installed at once.——The Little Johnnie has again resumed operations after a week's idleness. The main shaft was repaired and shipping at the former rate of 700 tons per day has been resumed. There are 73 sets of lessees on the property in addition to the large force of over 300 men directly employed by the Ibex company.

Toronto, Canada.

Railroad Lease Is Concluded.—Gold Discovery North of Cobalt.—The New Reduction Works.—Copper in Algoma.—Coal in Alberta.

The lease of mining rights on the right of way of the Temiskaming & Northern Ontario Railway Co., for which tenders were recently asked by the Temiskaming & Northern Ontario Railway Commission, has been granted on the same terms as the former lease cancelled by the Government, to an Ottawa syndicate composed largely of the same members as the original syndicate. The former deal aroused much criticism owing to the alteration in the advertised terms, and the substitution of a flat-rate royalty on the output for the sliding scale first proposed. When new tenders were called for, the flat rate of 25% on the value of the output was substituted. The successful bidders pay, in addition, a cash bonus of $50,000. There was only one other tender. The members of the syndicate are J. P. Dickson, A. W. Fraser, T. A. Bement, J. G. Turriff, Edmund Seybold, and George Goodwin. The first-named three belonged to the original syndicate. It is an open question whether the flat rate or the sliding scale, according to value, is more advantageous to the operators.

A number of prospectors have been at work in the area around Present or Larder lake in unsurveyed territory about 50 miles due north of Cobalt, where gold-bearing quartz has been discovered. Parties from Toronto and Hamilton have located a large number of claims and the land has been staked out for miles back from the lake shore. The country is reached by canoes by way of Tomstown and Wendigo lake.

On the 10th inst. the corner-stone of the refining works to be erected by the Montreal Refining & Reduction Co., at Trout lake, a few miles from North Bay on the Temiskaming & Northern Ontario Railway, was laid by Frank Cochrane, Ontario Minister of Lands, Forests & Mines, in the presence of about 2,000 people. Special trains were run from Cobalt camp and Copper Cliff. The plant will handle all kinds of ore with a capacity of 500 tons per day. The total cost is estimated at $2,000,000, and it is expected that when operated to their full capacity, 1,000 men will be employed. J. E. E. Leonard is president of the company. Mr. Cochrane, in his speech, congratulated his hearers on the fact that the lack of reduction works, which had retarded the mining industry, was being overcome, and hoped that before long Canada would not only be refining but marketing its own ore.

John Black, of Cobalt, who has a wide experience of American and Mexican mining, recently returned from an investigation of copper deposits in Algoma, about 40 miles from Sault Ste. Marie, bringing some rich samples, including one large piece of ore weighing about 100 lb. and running about 35% copper. He found surface veins from 10 to 15 ft. wide running 8 to 10% copper. The region, he says, is in a direct line—according to the lay of the land—with the copper lodes of upper Michigan, and the copper deposits may be a continuation of these veins. Several parties are examining and buying up properties; some big deals in prospects are said to have been made.

The property of the Taber (Alberta) Coal Mining Co., comprising about 11,000 acres underlaid by a 54-in. vein of valuable coal, has been taken over by the Canada West Coal & Coke Co., Ltd., of which O. A. Robertson, of St. Paul, Minn., is president, and F. E. Kenaston, Minneapolis, secretary and treasurer. The company is capitalized at $2,000,000 and will expend several hundred thousand dollars in improvements. Charlton Dixon, of Pittsburg, has been appointed mine manager, and D. E. Adams, late secretary and treasurer of the Taber Coal Co., will be general sales manager.

Butte, Montana.

Amalgamated Officials Express Opinions on the Copper Market.—Conditions Healthy.—Tremendous Production of the Amalgamated Smelters.—Extent of the Mining Operations.—Work at the East Butte.—The Silver Bow No. 3 to Be Re-opened.—Ryan to Succeed Rogers.—Butte & London Making Progress.—North Butte Getting Plenty of Ore.

John D. Ryan, managing director for the Amalgamated Copper Co., John Gillie, general superintendent and E. P. Mathewson, general manager of the Amalgamated smelter at Anaconda, make statements indicating that the Amalgamated has not a pound of copper on hand and that the product is sold far in advance through the United Metals Selling Co., of New York. Mr. Ryan says the demand more than keeps pace with the production, and that the world's output of copper last year did not exceed that of the preceding year by more than 5%. This year will show very little more of an increase over last, while the demand for the metal has been steadily increasing. "Copper mining the world over," says Mr. Ryan, "is a solid stable industry now, and very great increases or decreases in production are not likely to be experienced. New copper districts are being developed, but the very nature of the ore deposits and the necessity for large and expensive plants for treatment make the new districts come along rather slowly. It is not possible—and never will be—for any flood of copper to be poured into the markets of the world suddenly from any source whatsoever. The copper industry is in a satisfactory condition. Prices of the metal remain very good and the demand larger than at any time in the history of the business. This is due to general prosperity all over the country. Nearly all the manufacturing countries of Europe are using more copper than ever before, and the increase in the demand in the United States has been so great as to warrant an advance in the price of the metal, and that without any indication of diminishing consumption." Mr. Gillie says the Amalgamated selling agent recently received an order from a Rome, N. Y., buyer for a million pounds of copper at 19c. per pound, and he was urged to take half that amount so that other customers could be supplied. This indicates the condition of the supply. Mr. Mathewson says there is no copper stored anywhere, and that the product has been sold in advance for the year.

During the first six months of the present year the Washoe smelter of the Amalgamated Co. produced 94,244,911 lb. copper, 3?,811,735 oz. silver, and 22,567 oz. gold. The smelter of the Boston & Montana Co. (also Amalgamated), at Great Falls, produced during the same period about a third as much as the Washoe. At present the Washoe smelter is producing copper at the rate of 11½% of the total production of the world, and 22% of the total in the United States. The Washoe production last year was one-tenth of the world's production. Last year the smelter produced 165,905,144 lb. copper, 7,046,485 oz. silver, and 49,685 oz. gold. The following figures show the smelter output during four years and a half and also indicate the gradual increase of the production:

	Copper. lb.	Silver. oz.	Gold. oz.
1902 (eight months)	82,992,361	3,368,133	15,027
1903	109,726,420	5,190,879	31,183
1904	138,078,499	6,481,318	46,344
1905	165,505,144	7,046,485	49,685
1906 (six months)	94,244,911	3,811,735	22.567

During the same period the smelter paid out $26,790,986 in operations—$7,007,324 for labor, $4,293,455 for coal, $4,012,000 for coke, $740,047 for lime rock used in smelting, $1,316,020 for machinery, $53,896 for lumber, and $1,480,813 for railroad freights. The total value of the

ore treated from the Butte mines in that time was $104,316,089, the smelter receiving its supply, an average of 8,000 tons per day, from the mines of the Anaconda, Parrot, Trenton, Washoe, Butte & Boston, North Butte, East Butte, Red Metals, and Pittsburgh & Montana companies. The smelter consumes daily 14,000 tons of material, including ore, coal, lime, and coke. About 80% of the ore shipped to the Washoe carries less than 6% copper and is sent to the concentrator. The smelter employs 2,337 men in the works and 376 in auxiliary industries; it was built at a cost of $9,500,000.

The smelter's production in 1902 was equal to 13% of the world's supply, and in 1903 it was 8.3% of the world's production and 17% of the production in the United States. In 1904 the Washoe produced 10% of the world's production of copper, and between 18 and 19% of the total of the United States. Last year its output was 20% of the world's supply and 10½% of the production of the United States.

An important by-product of the Washoe smelter is arsenic, which is extracted from the flue-dust. In 1904, when the arsenic plant was started, 2,597 tons of flue-dust were treated. The following year there were 3,109 tons and during the first six months of the present year 2,291 tons were treated, a total for the entire period of operation of 7,997 tons. Up to the first of July of the present year 1,107,178 lb. arsenic had been recovered, of which 903,178 lb. have been shipped, the remainder being still on hand.

According to figures just made public the operations of the Amalgamated mines in Butte are on a scale just as stupendous as those of the Washoe smelter. The figures do not include the mines of the Boston & Montana Co., which are also Amalgamated. The Anaconda Co. employs 3,174 men, the Parrot 378, the Trenton 232, the Washoe 326, and the Butte & Boston 438. The payroll of the Anaconda for the first six months of the present year amounted to $1,967,489.46; Parrot, $160,674.72; Trenton, $55,221.45; Washoe, $203,262.69; Butte & Boston, $259,816.51. The total payroll of the Amalgamated Co., excluding the Boston & Montana Co., for the six months amounted to $5,045,582.57. The same companies paid in the same time $1,415,890.35 in local railroad freights, and $3,000,000 for all freights, including freight on copper to the seaboard. Freight on copper amounts approximately to $1,000,000 yearly. The same companies have in six months paid $844,026.44 for coal, $799,679.36 for coke, $156,858.75 for lime rock, and $286,533.32 for lumber.

All of the Amalgamated mines in Butte produce about 14,000 tons of ore daily. The Anaconda Co. operates the Anaconda, Never Sweat, St. Lawrence, Mountain Consolidated, High Ore, Bell, Diamond, J. I. C., Belmont, Gallatin, Sunnyside, Buffalo shaft, and some smaller properties. The Washoe Co. gets its ore supply from the Moonlight, Cambers, Paulin and Odin mines. The Butte & Boston Co. works the East and West Gray Rock, Silver Bow No. 1, Silver Bow No. 3, Berkeley and Kane No. 3 mines. The Trenton operates the Gagnon and several smaller properties, and the Parrot is confining its work to the Parrot mine.

No. 1 shaft of the East Butte Mining Co. has reached a depth of 500 ft., and No. 12—the four-compartment shaft being sunk at the southern end of the company's ground, and to be connected with No. 1—has reached a depth of 210 ft. Some cross-cutting has been done on the 400-ft. level and several veins have been opened, but no drifting will be done until the shaft is 1,000 ft. deep. Stations will be cut at the 600, 800 and 1,000-ft. levels. The East Butte lessees are mining about 150 tons of ore daily at present. In August there was a slight falling off in the royalties paid the company owing to the fact that the concentrator was shut down for repairs. Some new machinery has been added and the plant is again treating about 100 tons of ore daily. A new concentrator of 150 tons daily capacity has been built by East Butte Co. interests and will be in operation within 30 days, when the shipment of second-class ore will be increased. About 10 acres of mineral ground lying east and west of the East Butte Co.'s ground, which was in litigation between the Amalgamated and Heinze, has been equally divided between the Boston & Montana Co. and Red Metal Co. by the Heinze settlement and each company will mine its portion of the ground. There are several rich copper veins in the ground, which have been opened by the East Butte Company.

Since the developments made by the East Butte Co., the Butte & Boston has determined to reopen its Silver Bow No. 3 mine, which lies just northeast of and adjoins the East Butte. It had been the intention of the company to dismantle No. 3 and work that property through No. 1, but the work of dismantling has been stopped.

The East Butte, which recently went into the copper precipitating business and is working over the tailing of the old Parrot smelter, is about to make its first shipment of precipitate, its tanks being full. The company has more than a mile of precipitating boxes.

A story from Boston and New York is that John D. Ryan is to succeed H. H. Rogers as president of the Amalgamated Copper Co. and that he will take the active management of the company and its affairs. Mr. Ryan, when asked about the report, would not confirm or deny it. "All that I can say is that I know nothing about it," was his answer. The report is generally believed to be true.

The Butte & London Co. is making good progress with the shaft being sunk on the Greendale claim. It has reached a depth of 615 ft., and is in very hard granite. The Butte & London has a fine surface plant, one of the best among the new companies—in fact, an extravagant expenditure has been made for surface improvements, buildings, etc. A new hoisting engine has been installed. The shaft will be put down 1,500 ft. before any cross-cutting will be done. Three of the veins in the ground of the Butte Copper Exploration Co. pass through the Greendale.

The Butte Copper Co., owning the Anselmo No. 1 and No. 2, the Robert Emmet No. 1 and No. 2, and the Trifle lode claim, has placed a new hoisting engine on the Trifle and has begun sinking the shaft, which is now down 300 ft. and will be taken to the 1,500-ft. point. New boilers, air-compressor and other machinery have also been installed.——The Davis–Daly Estates Co. is sinking on the Colorado and Silver King mines and within a week will also begin work on the Mt. Moriah. Rapid progress is being made in driving the cross-cut south from the 1,600-ft. level of the Original mine, and it is expected that within 60 days one of the big veins ought to be reached.——The Butte & Bacorn and Butte Hill Copper Co. are prosecuting development work on their properties in the new district north of the town. The Butte Hill Co. has done some driving on the copper vein opened at a depth of 200 ft., but there is nothing more there than the promise of ore deeper down.——The North Butte Co. is working at a depth of 1,700 ft. with two shifts per day. About 1,600 tons of ore are hoisted daily, the larger part of which is first-class. The orebody at that depth is from 6 to 33 ft. wide. The company will soon begin work on a cross-cut from the Jessie mine north to the Berlin, one of the claims in a group acquired by the company about a year ago.

Calumet, Michigan.

Copper Statistics for 1906.—Output of Lake Superior Region.—Great Production From Calumet & Hecla.—Increased Capacity of Mills.—Gossip Concerning the Cananea Central.—New Machinery at the Hancock.—Progress at the Ahmeek.

The output of copper from the Lake Superior mines during the current year is likely to show a gain over 1905, notwithstanding several serious strikes, and the crippling of the Tamarack mine by a stubborn fire, the wrecking of the Atlantic and the closing down of the Phœnix mine.

The following table is from advance sheets of Horace T. Stevens' 'Copper Handbook,' and may be considered official, the returns, with the sole exception of the small amount of 75 tons, listed under 'miscellaneous,' being reported directly by the producers. The figures of the Calumet & Hecla vary from those previously published, for the reason that the fiscal year of the Calumet & Hecla does not end with the calendar year, in addition to which the company reports its annual output in two ways, one being the estimated copper contained in the mineral produced, while the other gives actual production of refined copper. In this case the figures are for the actual amount of fine copper produced during the calendar year 1905. The table follows, and for purposes of comparison the products of the preceding year are given also:

Mine.	(Pounds Avoirdupois) 1904.	1905.
Calumet & Hecla	80,341,019	95,100,610
Osceola	20,472,429	18,948,965
Quincy	18,348,160	18,827,557
Tamarack	14,961,885	15,824,008
Champion	12,212,954	15,707,426
Baltic	12,177,729	14,384,684
Trimountain	10,211,230	10,476,462
Wolverine	9,761,455	9,464,418
Mohawk	8,149,515	9,387,614
Franklin	4,771,050	4,206,085
Atlantic	5,321,859	4,049,731
Isle Royale	2,442,905	2,973,761
Michigan	2,746,127	2,891,796
Mass	2,182,931	2,007,950
Adventure	1,380,480	1,606,208
Ahmeek	350,000	1,552,957
Centennial	641,294	1,446,584
Phœnix	1,162,201	273,219
Winona	646,025	.....
Miscellaneous	50,000	150,000
Totals	208,329,248	229,270,035

Analysis of the foregoing data suggests many interesting deductions. The most important of these is the great increase in production by the Calumet & Hecla, which gained nearly 20% in output, bringing this mine, from fourth place in 1903 to first place among the copper producers of the world. The increase in output by the Calumet & Hecla is due, not mainly to smelting reserve mineral as has been erroneously stated, but rather to a largely increased rate of production, rendered possible by the great increase in milling facilities provided. The work of re-constructing the stamp-mills at Lake Linden has been under way for three years, and is nearing completion. The number of stamps in the three mills is not being increased, but the newer stamps are of greater power, and there has been a marked increase in the capacity of the dressing machinery. As the two older mills have been re-built in two sections each, 25% of the ultimate stamping capacity of the new mills, or an average of 20% of the total future capacity of all three mills, has been lacking at all times, and remains lacking with the completion of the work of re-building the fourth and final section of the two old mills, the Calumet & Hecla will be given a further increase of 20% in stamping capacity, in addition to the third section being completed during 1905. Hence it is safe to state that within a year the Calumet & Hecla will have a stamping capacity of at least 125,000,000 lb. of fine copper yearly, and the mines are amply able to supply ore to the full capacity of the mills, hence by 1908 the Calumet & Hecla should be on a normal productive basis of ten million pounds fine copper monthly. No copper mine of the world has made as much as 100,000,000 lb. of fine copper in any year since 1902, and the Anaconda, of Montana, is the only mine that ever has made that amount in any year, production of the Anaconda having reached or exceeded that figure for seven consecutive years, from 1896 to 1902 inclusive, with a high-water mark of 131,471,127 lb. in 1897.

Thomas F. Cole, W. C. Greene and John D. Ryan have been conferring at Mr. Cole's home, in Gogebic county, on mining matters in which they are interested. It is understood that plans for the future development of the Cananea Central Mining Co.'s lands, adjoining the Greene Consolidated (in Sonora, Mexico), were discussed. The Cananea Central was organized a few weeks ago, W. C. Greene and the Greene Consolidated Co. each being heavily interested, the latter owning one-third of the entire capital stock issued. Chester A. Congdon, of Duluth, a director of the Cananea Central, says that there will be no exchange of stock by the Cananea Central for Cananea & Duluth shares, the Cananea Central Co. acquiring nearly four-fifths of the capital stock of the Cananea & Duluth outstanding from the original promoters. Reports have been current in the Lake Superior mining regions for the last few weeks that Messrs. Cole and Ryan would become identified with the management of the Greene Consolidated Co., many of these reports coming from good sources. The fact that Cole, Ryan and their associates control the Cananea Central, in which the Greene Consolidated, operating adjoining lands, is heavily interested, gives color to these rumors. It has been reported that a consolidation of the two properties was contemplated. However this may be, there is no question but that Messrs. Cole, Ryan and their associates are largely interested in the Cananea camp, and while the actual control of the Greene Consolidated is unlikely to pass to their hands, it would not be surprising if they became larger owners of Greene Consolidated shares, and were given representation in the management.

The new hoisting engine for the Hancock Con. mine, a Lake Superior property controlled by Thomas F. Cole, John D. Ryan, Captain James Hoatson and associates, has been delivered at the property. The engine will hoist from a depth of 1,500 ft. and will meet the needs of the company during the next two years, or until a larger hoist for permanent service is required. The air-compressor has been delivered by the Sullivan Machinery Co. It has a capacity to compress 1,400 cu. ft. of free air per min. and will permit the operation of 20 drills in the mine. Two 125-h.p. boilers are installed at the old Hancock shaft. Three pumps are in service in the shaft; one is a sinker, suspended in the shaft and lowered with the water; the other old one is a station-pump and the new one is a sinker. The water in the Hancock shaft has been lowered 250 ft. below the surface and it will require until November to drain all the workings. The Hancock lode is about 12 ft. wide and the old records of production show that it averaged 22 lb. refined coppr per ton which is above the average of some of the dividend-paying mines of the Lake district today. The first and second level in the Hancock have already been entered, as the water is sufficiently low, but the walls are covered with slime and no examination has been made, which cannot be done without breaking down some of the rock. This will not be done until the unwatering of the shaft is completed. On surface the Hancock Con. is finishing its work on its power building. This structure will contain under one roof the compressor, hoisting engine and boilers. A

blacksmith shop is being built, also a change-house is in course of construction.

The steady increase in the working force of the Ahmeek and North Kearsarge mines necessitated the erection of additional dwelling houses there for the use of the workmen and their families. At the North Kearsarge 20 new buildings are being erected and at the Ahmeek 30 are in the course of construction. The Ahmeek is steadily increasing its production. As soon as the new surface equipment is available the mine will show an important gain in output.

London.

Dolcoath Doing Well.—Deeper Mining Encouraged,—Wheal Vor Shares Over-subscribed.—New Equipments for This Mine.—Electric Power in Cornwall.—Good Price for Tin.—The Heavy Dues to Landlords.—Decreasing Gold Output From Mysore.—Good Returns From Oroville Dredging.

At the Dolcoath general meeting the half-yearly accounts to June 30 were not only pleasing to the stockholders but appear to have given the greatest satisfaction in Cornish mining circles. The profits earned during the six months are far in excess of any figures hitherto shown in favor of the shareholders of this famous mine. The nearest approach to the present profit was in the first half of 1900, when the net gain was £32,414. This time it is £7,751 more, namely, £40,165. The following points of the accounts are of general interest:

Profit earned	£40,165.13.11
Tin ore crushed	49,934 tons
Black tin sold	920 tons
Produce per ton of ore	41.28 lb.
Average price per ton of ore	£1.18.11.5
Average price per ton of black tin	£105.13.4
Amount realized	£97,268. 0.9
Receipts	£97,910.18.0
Working costs	£54,502.18.9
Gross profits	£43,407.19.3
Lord's royalties	£3,242.5.4
Receipts per ton of ore raised and treated	£1.19.2
Working cost " " " " "	£1.1.1
Lord's dues " " " " "	£0.1.3
Total " " " " "	£1.3.1
Company's profit " " " " "	£0.16.1

In the course of his address to the meeting the manager said the shareholders would be anxious to hear something about the bottom developments more recent than the report. The 490 fathom level was now 18 fm. east of the eastern winze, and produced upwards of 100 lb. tin to the ton of stuff. The cross-course had been driven five fathoms through the lode without having yet reached the foot-wall granite. At present the lode produced 45 lb. tin to the ton of stuff; but he should be disappointed if they did not get higher values after extending the cross-cut to the foot-wall, where in the upper levels the richer ore was found. The new sump-shaft had been sunk to the 490-fm. level, and at this level the 490 had been driven 18 fm. west of the winze. The change of ground in the drift east of the new sump-shaft was distinctly encouraging and significant, inasmuch as in other parts of the mine tin had been found near similar ground. One had to think geologically both in time and extent to properly appreciate the comparatively insignificent depth which had been attained, and it struck him that the policy to be persistently pursued was the prosecution of mining still deeper.

One of the newly floated companies, Wheal Vor, Ltd., has issued a circular, stating that the 96,000 shares of 10s. each which were offered for subscription were largely over-applied for, and duly allotted, and as the promoters paid all expenses up to allotment, 80% of the total capital of the company will be represented by cash available for work. After the capital was subscribed, an opportunity arose for the acquisition of other properties immediately adjoining the Wheal Vor, which were of considerable value. These properties were acquired. As it is not deemed wise for the company to attempt to develop the whole of their properties, it is contemplated to sub-lease some portions. Included in the properties obtained was the Wheal Metal mine, together with the stamps and dressing floors. The acquisition of the latter will enable this company to at once begin making some returns by crushing the ore from the burrows on this and the Wheal Vor setts. Work has been pushed on as rapidly as possible on the Wheal Vor sett, and Borlase's shaft has now been cleared and put in thorough order down to the adit level. This shaft, which is vertical to a depth of 144 fm. below the adit, is 14 ft. 6 in. by 7 ft., and was found to be in excellent condition. A winding-engine and two boilers have been purchased, the former being already on the ground. The headgear has been designed, and is in course of construction. An arrangement has been made with the Duchy Development Association for the supply of electrical power, by means of which high-lift electrically-driven pumps will be worked. The rental of the installation will be extremely moderate, and when the Duchy Development Association is in a position to deliver power in bulk from a central station, the Wheal Vor Co. will be able to secure electrical energy at a lower figure than would be probable with a separate unit.

At the last reported tin-ticketing 242 tons of black tin were sold for £25,371, at an average price of £104. Dolcoath was, as usual, the biggest seller, securing £7,306 for 67 tons. Birch Tor and Vitifer, a new mine situated on the Dartmoor, received the highest price of the ticketing, namely, £118 15s. per ton, Clitters United Co. getting £115 2s. 6d. per ton for their parcel of 13 tons. While the prices obtained were highly satisfactory, it is to be noted that the total quantity sold shows no increase in the general output of black tin.

The question of 'lord's dues' continues to excite attention and comment. The custom has been traced from the early days when alluvial tin gravels existed in Cornwall, and when the tinner exercised the right to enter on any unenclosed land, mark out his 'bounds,' work the sett in his own way, and hand over one-eighth of the produce in kind to the lord of the manor. The opening of a new or old tin mine means the expenditure of thousands of pounds before any profits, or even any return at all, can be expected. Yet the landlords have hitherto exacted their pound of flesh in the shape of dues, and have charged £100 per acre for all land covered with debris or destroyed. It is said the best lease in existence in Cornwall today is at Wheal Grenville, where the dues are only out of profits and amount to one-fifth thereof. East Pool pays no dues except when there are profits, paying then one-fourth of the same. Wheal Agar, attached to East Pool, pays dues whether there are profits or losses; and during the nine years ended with 1905 is reported to have paid over £1,200 to the lord—notwithstanding that the loss on this section has been over £13,000. East Pool and Agar together, after repayment of £25,000 of calls, have divided £8,480 while paying £7,518 in lord's dues. According to the *Financial News*, it is understood that many of the recent leases have been so drawn up as to give much fairer terms. Lords apparently recognize that the ancient laws have crippled speculation, and are eager to show that they are willing to co-operate with any bona-fide capitalists.

During the month of August the output of the producing mines in Mysore, India, was 45,644 oz., showing a decrease of 450 oz., as compared with the preceding month, and a decrease of 5,156 oz. as compared with the corresponding period of 1905, while on the eight months to the end of August there is a falling off to the extent of over 30,000 oz. A decrease is also to be noted in West

African mines, the majority of which have shown a steady decline since May last; Ashanti Goldfields is the exception, the return for August being 3,609 oz., against 3,318 for July.

The quarterly dividend of 12½ cents per share just declared by Oroville Dredging, Ltd., completes the distribution of 10% for the first financial year of the company to July 31. Having regard to the substantial weekly returns which have been announced from the property for some time past, it is evident the directors have observed a conservative policy in the matter of dividends, and it is thought stockholders may look forward with some confidence to an increased distribution of profits in the near future without detriment to the sinking fund for redemption of capital as originally contemplated.

Denver, Colorado.

Politics and the Humor of Them.—Our Correspondent Says a Thing or Two.—Two Attorneys, Well-known in Mining Litigation, are Prominent.—A Dramatic Scene at the Convention.—Mining on the Williams Fork.—Reduction Works for Silverton.

Denver has just been the interested observer and host of the Democratic and Republican conventions. I say 'observer' advisedly because the people of Denver had nothing to say in either case. Each convention was controlled absolutely by the powers that be and the citizens were allowed to stand outside and get what amusement they could out of watching the bosses name their future public servants. And the people certainly got their money's worth so far as the Democrats were concerned. Of course, we always knew that the honey-mouthed politician went around before election telling the people how valiant he was going to be in defending their rights against the encroachments of the powerful and tyrannical corporations, and then after the election we knew that the same politician would probably enter a mad race for the 'retainers' of these same tyrannical corporations. We knew all this, but it was very entertaining to hear the leaders of the State Democracy give facts and figures relative to particular deals in which these particular defenders of the people had participated. The trouble all arose because Mayor Speer and Senator Patterson could not agree before-hand as to how the watermelon was to be cut. Mr. Patterson does not want to be senator again, so he says, but he thinks all other powerful candidates should be safely chained up so that when the time comes there will be no one else for the job and he will be simply forced to take it. Mayor Speer thinks he has been a pretty good mayor, as he has, and thinks he could comfortably fill a governor's or senator's chair. The net result of these incomptaible thoughts was that two delegations presented themselves to the convention for recognition. Mayor Speer had C. J. Hughes, Jr., Charles Thomas, and other prominent old-time Democrats with him, and Senator Patterson had just himself and some satellites. The convention was committed by general agreement to a rabid anti-corporation platform, so it behooved each side of the controversy to show what rank corporationists the members of the other side were and how pure and valient in the interests of the people their own members were. Never before has Denver been treated to such an insight to the secret counsels of political leaders. (Perhaps I ought to say Democratic leaders, but I don't believe in heaping all the blame on the fellow whose dinner bucket broke open and exposed the 'high-grade' inside. The other fellow's dinner bucket may conceal just as much stolen ore if we could open it). It would have taken an investigation committee and a prosecutor Hughes (of New York) six months of hard work to expose all the rottenness that was revealed in four short hours of oratorical bombardment between these giants of Democracy. While the disclosures made were revolting, the oratory was such as is seldom heard. Hughes and Patterson excelled themselves. Both spoke from a breast full of bottled-up feelings. Hughes' best weapon is his searching sarcasm and never before has he wielded that keen-edged weapon with greater precision or more merciless effect. Patterson is forceful and logical and has a wonderful faculty for putting a bad case in a good light. It was this gift that made him a great criminal lawyer. He needed all his talents to hold together his followers, but he has it, and won out. Patterson, it should be said, has been at the head of the Democratic machine for several years. He had personally selected two-thirds of the delegates, so, of course, he was talking to a sympathetic audience, while the Speer people were talking to antagonists. In view of this fact the speech of Charles S. Thomas, former governor of the State, was one of the most brilliant pieces of oratory ever heard in Denver. If shrewd old Patterson had not so arranged it that he himself had the closing speech, Thomas would have stampeded the convention. His English was as perfect as though the speech had been carefully written, his logic was convincing and forceful, his presentation of the crimes of his adversaries filled his hearers with contempt for such rascals and he finally wound up with as pretty a play on the emotions as was ever enacted by a politician. On the Patterson side of the house sat ex-Sheriff Jones, who, as the hireling of the Tramway company, had been in a gun-fight at one of the disgraceful city elections of a few years back. Thomas had placed in his delegation an innocent man who lost a leg as a result of the above-mentioned gun-fight. As a climax to his wonderful speech he contrasted these two men. The one, a wicked hireling of the corporations, who in his zeal to serve his masters, hesitated not at bloodshed. The other, a pure and undefiled Democrat who was simply bent on exercising his right as an American citizen to vote for his chosen candidates, and in so doing was maimed for life. The incident was most dramatic. The convention was inflamed almost beyond control. But for Thomas himself, who held the vast throng, as it were, in the hollow of his hand, ex-Sheriff Jones would have been torn limb from limb and Patterson and all his delegation kicked into the street. It was a shame that the necessity of saving a human life, and such a worthless one at that, should defeat such a splendid effort. Thomas waved back the mad crowd that was rushing at Jones, and made them take their seats and—the spell was broken. Then Patterson arose and quietly but sternly drove his excited cattle back into the corral again and put up the bars. The vote was 531 to 163 against the Speer delegation, and Patterson named the candidates and wrote the platform and saw to it that Adams, the leading Democratic candidate for senator, was securely bound by pledge and platform to the nomination for Governor.

In a mining way there is not much news. Good strikes continue to be made in Cripple Creek, Clear Creek county, Gilpin county, and the San Juan. Perhaps the most important news of the week is that which comes over the range from the Williams Fork country, which is the southern part of Middle Park and tributary to the Moffat road. The ranchmen's window-sills were full of zinc, lead, and copper specimens twelve years ago when I rode through that country, but only just lately has anything commercially important been developed. The Bobtail, Luella, and Hagarstown properties in La Plata district have all struck ore, and the Bobtail is reported to have a narrow streak, in addition to four feet of low-grade stuff, that runs $600 per ton. The principal ores thus far discovered are zinc and lead.

The San Juan Smelting & Refining Co., of Silverton, announce that they are going to put up a reduction plant of 300 tons daily capacity to handle the ores of the old Henrietta mine.

Salt Lake, Utah.

Increase of Miners' Wages.—Transfer of Alta-Quincy.—The Daly-Judge to Resume Dividends.—Weekly Returns From Tintic and Park City.—Increased Business of Local Stock Exchange.—News From Cactus and Sevier Properties.

The management of the Horn Silver Mining Co. has granted employees an advance in wages of 25 cents per day. Miners receive $2.75 now. Tintic mine operators recently increased wages of hand miners to $3 per day, just what machine men have been getting. The latter have made a request for an advance to $3.25, which is being considered.

Petitions have been filed in the District Court for the voluntary disincorporation of the Red Wing Gold Mining Co., Minnie Gold Mining & Milling Co., Highland Boy Con. Mining Co., Pedro Mining Co., and the York Mining Co. All are Bingham concerns, which have been absorbed by stronger corporations.

The management of the Uncle Sam Con., following the practice of several other Tintic companies, has let out several blocks of ground to lessees. The Yankee Con. has its new compressor in operation and is preparing to undertake some extensive exploratory work. Contracts have been let for driving on the 200 and 500-ft. levels, and another may be let to sink the shaft deeper.

Shareholders of the Alta-Quincy Mining Co., at Alta, have ratified the action of the directors in consummating a sale of their mine to Tony Jacobson and associates, of Salt Lake, who will undertake a vigorous campaign of development. The purchasers are said to be negotiating for the Albion mine adjoining, with a view to effecting a consolidation. A control of the South Columbus mine has also been acquired and it may be included in the merger.

The Daly-Judge mine, of Park City, will be on a dividend basis in January next. The directors have decided to make quarterly distributions, the amount to be determined later. John J. Daly, the president of the company, has made the statement, however, that the basis will be not less than 30 cents per share, or $360,000 annually. The company had a bonded indebtedness, in January last, of $209,000 and an overdraft of $22,000, which has been liquidated and the treasury now contains about $150,000. The net earnings have been approximately $45,000 monthly since the beginning of the year.——The management of the Nelson Queen Mining Co., operating at Park City, is preparing to install some new hoisting equipment.——The Intermountain Exploration Co., a new corporation, has taken over the No-You-Don't mine, at Stockton.

Ore shipments from the Tintic district to Salt Lake smelters last week amounted to 108 carloads, the shipping mines and respective amounts being: Centennial Eureka, 25; Eagle & Blue Bell, 6; Eureka Hill, 13; May Day, 4; Yankee Con., 5; Beck Tunnel, 5; South Swansea, 1; Uncle Sam Con., 3; Bullion Beck, 5; Gemini, 11; Scranton, 4; Dragon Iron, 5; Swansea, 1; Victoria, 3; Grand Central, 3; Mammoth, 2; Carissa, 5; Ajax, 3; Star Con., 1; Godiva, 2; other mines, 3.—— The output reported from Park City mines last week amounted to 2,310 tons, the shippers and respective amounts being; Daly Judge, 819 tons; Silver King, 600; Daly West, 460; Little Bell, 174; Ontario, 206; Kearns-Keith, 51. Last week's settlement for ore and bullion in Salt Lake amounted to $383,800 and during the same period the sales of the Salt Lake Stock and Mining Exchange totals 518,520 shares, representing a valuation of $249,515, as against 130,524 shares for $29,093 during the corresponding period a year ago.

Cripple Creek, Colorado.

Troubles of the Pharmacist Co.—Activity on Beacon Hill.—Home Run Is Prosperous—Rich Strike in the Vindicator.—Discovery in the Minnehaha.—Another Cyanide Mill to be Started.

The annual meeting of the Pharmacist Co. is to be held on September 24, when lively proceedings are anticipated. James F. Burns and the minority stockholders will endeavor to oust the president of the company, Walter F. Rock. A circular letter has been sent to all stockholders by Burns in which several complaints are set forth against the management of the company's affairs by Rock. The abolishment of the practice of paying a salary to the president and general manager is also desired. Reply to the charges has been made by Rock also, in a letter to stockholders, in which he claims that looking after the interests of the company has caused him a good deal of expense, and he at the same time accuses Burns of creating discord among the stockholders. The outcome of this meeting is looked forward to with interest.—A car of ore has recently been shipped by Gagner, McDonald and Simonton leasing on the old Gold property, on Beacon hill. The ore is being broken from the winze on a 385-ft. level and is expected to give returns of $60 in gold. Another property on Beacon hill, the Gold Dollar, shipped a car of $30 ore on the 14th inst. from the Murray & Ragland lease.

A new shaft is now being sunk on the Mabel M. claim of the Gold Dollar to a depth of 600 ft., which is approximately the water-level of that part of the district; a cross-cut will then be driven to cut an orebody found above in the Zoe claim.——Another clean-up has been made at the Home Run Mining & Milling Co., a gold brick valued at $2,000 being obtained ——The Jerry Johnson Mining Co. held its annual meeting at Cheyenne on the 11th inst., no change taking place in the board of directors for the ensuing year. The board consists of F. M. Woods, Chas. Potter, J. W. Graham, Sr., and A. F. McKay. James F. Burns, who holds 22,000 shares, tried to secure a disapproval of the treasurer's report and the election of the board of trustees, but failed. He also asked to have the books of the company audited, but this request was also voted down.——A big strike is reported to have been made, by Hatcher & Seely, on the Hull City claim of the Vindicator Gold Mining Co. A talc seam of fair width is being gouged out with picks and sacked, assays as high as 45 oz. having been obtained. Two cars of $50 ore have this week been shipped from the recent strike on the 500-foot level of the Aileen property, on Guyot hill. This property is being worked by the Colorado State Investment Co., of which John Sharpe is general manager.

A big strike is reported to have been made on the 450-ft. level of the Minnehaha claim of the Jennie Sample Co., on Raven hill. The shaft has lately been sunk to this depth and the ore was encountered in a cross-cut 40 ft. west of the shaft; it is 4 ft. wide and is thought to be the Ophir vein. This vein has lately been in dispute between the Ophir and Jennie Sample Co., the latter company having brought suit against the Ophir for ore valued at $200,000, said to have been wrongfully extracted by them.——Cavanaugh & Co. have obtained a lease on the Wild Horse mill, on Bull hill, of the United Gold Mines Co., and will shortly start operations, the mill having been idle for about a year. The ore will principally be obtained from a 40-ft. dike on the 900-ft. level of the Wild Horse mine on which Cavanaugh & Co. have also obtained a lease. Cyanidation will be used.

Mining Summary.

ALASKA.

Jules Marion, superintendent of the Northern Commercial mail service, states that during the coming winter there will be a weekly service over the route between Nome and Dawson. This service is to be given the year round whether ice is running or not. Between Circle and Fairbanks there will be a service each way every two weeks during the winter. Between Eagle and Circle, horses will be used. On the main river below Circle dogs will be tried, as that stretch is too rough and too heavily drifted for horses.——A shipment of gold amounting to $30,000 has been received in Seattle from the discovery claims on Eureka creek, 150 miles southwest of Fairbanks and 30 miles north of Mt. McKinley. It is nearly all in large nuggets. One piece weighs 43 oz. J. Dalton, the owner, stated that the country was rich, but that there were few prospectors in there at present. Last summer 23 men were employed on the discovery claims.

ARIZONA.

COCONINO COUNTY.

(Special Correspondence).—The Rowe claims, recently discovered, are situated less than one-half mile from Bass' Station, on the Grand Canyon branch of the Santa Fe railroad, and the Highland Mary, upon which the high-grade ore is found, joins their right-of-way. The sedimentary formations are very thick throughout the entire canyon region, and heretofore only secondary forms of copper ore have been taken out, except in a few instances, along the fault line upon which these claims lie. For the most part the orebodies lie flat and are cheaply mined, being near the surface. The ore is copper carbonate, with an excess of iron. On the Highland Mary, several fractures in the formation have recently been uncovered, and while the displacement has only amounted to a few feet at any place, it seems probable that the pyritic, or original form of the copper, on this claim came from great depth. A vein of quartz containing copper, gold, and silver, with considerable lead, is exposed in various places for several miles in the granitic basement of the Grand Canyon, and as Rowe has found the same ore and also quartz in some of these openings, it is thought that development will reveal large bodies at no great depth. The assays show gold and silver in payable amount, and within the past few days the copper has increased greatly. He will ship a car to the Humboldt smelter within a week or ten days.

Bass' Station, September 15.

GRAHAM COUNTY.

(Special Correspondence).—A short time ago while crosscutting on the second level of the Longfellow mine, of the Arizona Copper Co., to connect with the new shaft being sunk near No. 5 concentrator, another vein was encountered, which assays 3% copper for a width of 40 ft. Since this discovery was made, another cross-cut has been driven 300 ft. farther east, and the old 50-ft. vein has been encountered. At the Yavapai mine, a drift has been started 26 ft. below the second level to connect with the second level of the Humboldt. Development work at the Clay mine is being carried on by means of electric drills. In order to test the extent of stoping ground above the main adit-level, several raises were put in from 15 to 90 ft., but without exposing ore good enough to stope for more than 30 ft., and the highest known point where stoping will be profitable is near the shaft, where the ore goes up 80 ft.—— The tramway of the New England Copper Co. has just been completed, and ore is now shipped to the Shannon Copper Co.'s smelter at Clifton, to the amount of 40 tons per day, which will be increased shortly. Since the election of a new board of directors of this company, its affairs seem to be taking on new life. The new directors are: E. R. Morse, Boston; Eugene Wambaugh, Harvard University; Alfred R. Hoyt, New York City; Rudolph Deme, Paris, France; Edmond Bristol, Toronto, Canada.——The Burro Mountain Copper Co. is shipping 600 tons of concentrate per month to the Shannon smelter at Clifton.

Morenci, September 15.

The Cuprite Copper Co. will put in a diamond-drill, with which to prospect its properties near Metcalf. The management hns concluded that it will be economy to first ascertain the position of the orebodies, after which the main shafts will be sunk.

PINAL COUNTY.

(Special Correspondence).—The Calumet & Arizona Mining Co. has purchased from J. Scanlan and E. A. Clark their group of copper claims situated in Bunker Hill mining district, on Copper creek, in this county. The consideration has not been made public, but is understood to be large. By this purchase it has secured what is believed by many to be the best copper proposition lying idle in Arizona today. The mine will be opened up on a broad basis.—— The Michigan-Arizona Mining Co. is pushing operations on its property, which joins the claims of the Calumet & Arizona, and is making preparations to begin shipping ore. The orebody is being blocked out from the 50-ft. level to the 200. This ore-shoot is 90 ft. long, 50 ft. wide, and carries gold and silver besides a good percentage of copper. Other workings are being pushed to another and much larger orebody and it is expected that this will be tapped within the next 50 feet.

Mammoth, September 8.

YAVAPAI COUNTY.

(Special Correspondence).—A large body of shipping ore has just been discovered in the Swiss Girl claim, one of the Bouman Copper Co.'s group, near Jerome. The body of ore was encountered about a week ago, when a cross-cut was started from the 960-ft. level of the shaft and the second round of machine-drill holes had been blasted. The cross-cut has already been driven a distance of 20 ft. without encountering a wall. The body of sulphide ore has been found to carry gold, silver and copper enough to make it profitable to treat it at the works of the Arizona Smelting Co., at Humboldt, where it is proposed to ship the product. A body of ore, similar in character, was found in the 500-ft. level, but the value of the ore at this depth was found to be too low for profit. The company has under consideration the construction of a narrow-gauge railroad from the Swiss Girl mine to the Humboldt smelter.

Jerome, September 15.

John S. Jones is preparing to resume work on the Little Jessie group in Chaparral district. The shaft will be sunk to a depth of 1,000 ft.——Engineers are to examine the property of the Eureka Gold & Copper Mining Co. near Jerome to outline future development. The outcrop on this property ran as high as $150 per ton gold, and at depth, where copper was encountered, the gold content was in places from $75 to $100 per ton, with as high as 30 oz. silver, and from six to 32% copper.——At the Mt. Union mine, 15 miles southeast of Prescott, a cross-cut on the 600-ft. level cut through four feet of ore which assays from $20 to $200 gold per ton.

CALIFORNIA.

CALAVERAS COUNTY.

The Union Copper Co., at Copperopolis, has decided to construct a branch railroad from its mines at Copperopolis to connect with the Southern Pacific railroad at Milton. The survey of the branch road is completed and grading gangs are now being secured. The rolling stock has been ordered and is on the way from the East. The length of the branch will be about 12 miles. Heretofore ore and supplies have been hauled in trains by traction engines. G. McM. Ross is manager.

ELDORADO COUNTY.

A new concentrator has been put in at the Sherman mill, near Placerville, to handle the increase in sulphides.——The gravel mine near Omo, belonging to Chas. Edner, has been bonded to Thos. Clark, of Placerville, who will start development work. —— At the Snow mine, near Newtown, the incline has finally reached bedrock and the channel is now being opened up. —— Work has been stopped at the Rosecranz mine, near Garden Valley. Near-by, the shaft on the Collins mine is being sunk, being down now 60 ft. —— Superintendent Phelps of the Cedar Creek mine, near Fairplay, will start a raise to reach the channel from the end of the bedrock adit, now 1,000 ft. long.

KERN COUNTY.

(Special Correspondence).—The Tungsten mine, six miles south of Johannesburg, on the branch railroad, is working steadily shipping scheelite to Eastern markets. Some concentrating tests are in progress on this ore at the Bagdad-Chase mill at Barstow. There is said to be a large amount of concentrating ore available in the mine.

Barstow, September 10.

NEVADA COUNTY.

Preparatory to hydraulicking at the Willow Creek Con. gravel mine at Weed's Point, near Camptonville, a long bedrock tunnel is being driven to carry away the debris.——C. L. Crane plans to work the Boss quartz mine, near Sweetland, through an open-cut with a steam-shovel. After the success in working the Utah copper mines by a similar process, this innovation in gold mining will be watched with interest.

SAN BERNARDINO COUNTY.

(Special Correspondence).—The mill of the Bagdad-Chase Gold Mining Co. at Barstow is in daily operation. The gold ore from the company's mines at Camp Rochester, eight miles south of Ludlow, on the Santa Fe, is not easy of treatment, and although much of it is of very good grade, none of it shows the presence of gold except by assay or milling. The cyanide process is employed with various modifications, made necessary by the presence of copper carbonate and oxide in the ore. In the process, ammonia is employed.

Barstow, September 10.

The new copper camp at Greenwater is reached by way of Ash Meadows. Several properties on the copper belt are being actively developed and plans are being made to test others. One shaft, that on the Clark property, is down 260 ft. There is but one frame building in the camp, but lumber is being hauled in as fast as possible. The lodging houses, restaurants and saloons are in tents. Plenty of water for domestic purposes can be had at $1.50 per barrel. The water supply is at the Furnace Creek ranch, 18 miles away, but a contract has been let by the Greenwater and Death Valley company for sinking several wells on the wash just below the Kunze camp. The district needs more teams for freighting purposes, more miners, and more carpenters. Miners are paid $4.50 per day and carpenters $8 per day. Johnnie is the closest railroad centre and $50 per ton is paid for freighting from Johnnie into Greenwater, a distance of 50 miles. The Tonopah Lumber Co. is sending 20 teams to Greenwater to haul lumber into the new district, but three times as many more teams could find steady employment at freighting. An automobile service will be started from Johnnie. A fare of $25 will be made for the one-way trip. At present the stage company charges $18 for the journey.

SHASTA COUNTY.

Fifteen men at the Afterthought mine at Ingot were given their time by the superintendent, S. E. Bretherton. The mine was temporarily short of muckers, and the foreman, instead of laying off the machine-men and causing them to lose their time from the shift of work, told them they could go right along, but instead of on the machine-drills it would be to clean up the muck for themselves and they would be paid at the regular rate for machine-men, although the rate for muckers was 50c. per day lower. The men, however, declared that they were machine-men, and before they would demean themselves with the labor of common muckers they would quit. Consequently, they were discharged immediately.

SIERRA COUNTY.

The Empire mine, at Gold Valley, has now been developed to a depth of 600 ft. A large amount of free-milling gold ore is in sight and several thousand tons are broken down in the mine ready for the mill, which has 25 stamps. There is also a chlorination plant at the mill. The property is lighted by electricity generated by the company's water-power plant.——Extensive improvements are also being made at the Empire Gold Mines, Limited, at Gold Valley. Fifteen stamps will be added to the mill, also several concentrators. Two new pay-shoots were recently found on this property, one in the valley below the mill, and another over the hill from the present development.——A good strike was recently made at the Antlers quartz mine 200 ft. below the croppings. It is richer than at the outcrop and larger. The Antlers mine is situated on the south side of Craycroft ridge, about one and one-half miles northeast of the Gold Bluff mine. In June last, H. W. Turner, of Portland, Ore., purchased one-third interest in the mine. The Antlers vein is different from other veins here, as it is decomposed and requires but little drilling or blasting. Work on the Antlers has been temporarily suspended until the arrival of Mr. Turner, who is in Alaska. In the meantime, however, Winrod and Deal will do assessment work on the Lost Pearl quartz mine, situated a short distance from the above-named property.

TRINITY COUNTY.

The Heslewood Mining Co., two miles east of Hayfork, has almost finished its eight-mile ditch. Men are now constructing flumes, mine buildings, and an elevator to handle the tailings. The mine will be running as soon as the water comes.——The Layman mine, near Hayfork, has been bonded for $25,000 by Humboldt county capitalists, who have begun development work.——The McCampbell mine has closed a profitable season's run, working 12 men and two giants.——The Bonanza King mine, near Trinity Center, Joseph Porter superintendent, is preparing to add 20 stamps to the 40-stamp mill under construction.

TUOLUMNE COUNTY.

Work at the Pennsylvania shaft of the Soulsby mine, at Soulsbyville, is still under way. A new bob is being placed at the 400-ft. level. When this is completed and the new pump at the 600-ft. station is in, the Pennsylvania shaft will have a pumping plant capable of handling all the water likely to be encountered in that end of the mine. The 15-stamp mill is being repaired. At the Davidson shaft the work of unwatering the old workings is still in progress.——Will Martin, who has been working on the buildings at the Soulsby, has taken a position at Middle Camp.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).——James Cousins, of Idaho Springs, has been appointed superintendent of the Doric mine by the X-Ray Gold Mines Co., succeeding John Larson. The company may shortly build a mill.——Work has been commenced by the Hendrie & Bolthoff Manufacturing Co., of Denver, on the foundations of the mills for the Griffith Mines Co., and the Democrat Mountain Mining Co. Each mill will have a daily capacity of 50 tons. The completion of these mills will permit an increase in the ore production of the camp as there are large bodies of low-grade lead and zinc ore ready for stoping in the mines, which have been lying idle for many years.——The Argentine Central railway has been extended to the Vidler tunnel of the Transcontinental Tunnel & Mining Co. The Vidler tunnel was driven 180 ft. last month and is now in 1,560 ft. on the eastern side of the range. On the western side about 100 ft. have been driven. The pipe-line, for compressed air, over Argentine pass, is nearly completed, and when finished machine-drills will be put in on the western side. Two 80-h. p. boilers have lately been set up and a large Rand Imperial type compressor is being installed, making three 80-h. p. boilers and two compressors at the tunnel. Excavating is being done preparatory to erecting a concentrating mill. A commodious boarding house has just been completed and everything is being put in shape for an uninterrupted winter campaign.

The Santiago Mining & Milling Co. is shipping 25 tons of high-grade lead ore per week from its mine in East Argentine to its mill in Georgetown where it is sampled and shipped to the Independent smelter at Salida. The company's mill is supplied with an excess of custom ore from almost every shipping mine in the district, as the company buys any ore from the lowest grade concentrating material to the highest grade smelting ore. There are five adits on the Santiago vein varying in length from 700 to 1,500 ft., all of which are connected by raises except No. 4 and 5. The orebody is continuous throughout all the adits and raises and varies in width from 1 to 6 ft. There is about 100 ft. between each adit.——The East Argentine Tunnel & Mining

Co., driving the Sidney adit into Pendleton mountain, has been making excellent headway. The adit is now in 1,500 ft. in which distance nine lodes have been cut. The company owns a fine water-power which operates the air-compressor furnishing all the power required nine months in the year at extremely low cost, during the other three months the adit is not driven. The company has a large and unexplored territory ahead of the adit.

Georgetown, September 15.

OURAY COUNTY.

There is a possibility of settling pending litigation on the Ruby Trust property at the next term of the District Court, when work will be resumed on the mine, which has been idle since the buildings were damaged by a snowslide about three years ago.——Work has been progressing satisfactorily at the Bagdad property in the Sneffels district, which is being operated by the Bagdad-Chase Mining Co. W. B. Kehoe is superintendent. The work of cross-cutting from the drift every 10 ft. is being continued, and the last few times the cross-cut has shown good ore. A contract will be let for driving 750 ft. The ore is lead-silver bearing and also contains copper. The Bagdad-Chase Co. is also operating extensively in California in San Bernardino and Tuolumne counties.

SUMMIT COUNTY.

(Special Correspondence).—The last strike made on the Wellington mine proves of greater importance than at first supposed. In a raise 150 ft. above the lower level, a drift run west 15 ft. struck a vein of zinc ore five feet wide assaying over 30% zinc. This has since opened out to eight feet. ——At the Wire Patch, the whole plant has been started up by the general manager, J. C. Putner. Mr. Knappie is at present in charge of operations.——At the Puzzle-Gold Dust, sinking is progressing on the main vein and the orebody is holding out strong all the way down. The electric power from the Colorado Con. plant is operating the hoist and pump satisfactorily.——A long-term lease has been taken by P. W. Breene on the Long & Derry mine, in the California district, and he expects to install adequate machinery and do vigorous development work.——The Summit-Banner Placer Co., operating in Iowa gulch, has had a successful season, under the management of Lemuel Kingsbury. The year's work has shown a good profit despite the fact that a lot of dead work had to be done. A dividend will be paid.

The old Robinson mine, at Robinson, in Ten-Mile canyon, has been leased by the International Mining Co. and new machinery is being installed. The company has also erected new buildings and is sinking a new three-compartment shaft, which is already down 100 ft. Drifting and stoping will not be commenced until the shaft is down 1,000 ft. This is giving a general impetus to the whole section and promises to revive the camp to the old-time activity prior to 1893. ——In the Felicia Grace, at Kokomo, the orebody recently struck is developing satisfactorily. The management intends to sink the main shaft 225 ft. farther to reach the second contact.——The Columbine has been started up again and the main shaft is being deepened.

Breckenridge, September 8.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The property of the Nevada Con. mines is the scene of much activity this week, as three 15-h.p. Union hoists arrived and were placed in position at the Black Dog, Lodi, and McGhan shafts. The shafts are now down 200, 180, and 85 ft., respectively, and all will be sunk to the water-level. One shaft, that on the Lodi, will be equipped with a cage, while the others will have a skip. Cross-cuts and drifts will be run every hundred feet. —— The Cyrus Noble vein is being cross-cut from the station on the 500-ft. level. The shaft is being sunk in the foot-wall, but the intervening distance at this depth is not great — less than 20 ft. The orebody continues to improve in value in the north drift. Several raises are being made, as well as chutes, so as to be prepared for extraction.

The Pacific Coast Mines Bureau has purchased the Green group, consisting of the Green, Green No. 1, Hero, and Arabo lode claims. This group lies in the southern part of this district, and adjoins the estate of the Saturn Mining Co.——The Searchlight Mining & Milling Co. is installing two 54-in., 70-h.p. boilers. The 25 tanks comprised in the cyanide plant have been moved from the Southern Nevada mine and placed in position west of the mill building.

Preparations are being made to sink a double-compartment shaft to water-level on the Duplex Extension. At present there is a 70-ft. shaft on the Eucher claim, belonging to this company, and the new shaft will be sunk 500 ft. east of this shaft on the same vein.——Frank Miller made a strike on his property in Eldorado canyon this week. On the Minnie M. claim he has oppened up three feet of oxidized quartz that runs $106 in horn-silver and $8 in gold. The property lies on a vein parallel to the Stoner group, now under option to Chas. Schwab.

At a depth of 100 ft. there has been an important change in the Annette shaft. What appeared to be a cross-vein has been cut and it materially affected the general character of the ore. There is more silicification and less copper-stain, also the grade is better. The shaft is being sunk on an incline of 76° and the foot-wall slip, which has been followed, still runs true. The vein will not be prospected until water-level is reached—at an estimated depth of 225 ft. —— The Searchlight Western Co. is cross-cutting the vein at the 150-ft. level for a distance of 18 ft. At the 200-ft. level the vein-matter is a bluish porphyry and impregnated with sulphides. The present contract calls for a 260-ft. shaft.—— The finest shaft in the Searchlight district is being put down by the Colorado Mining & Milling Co. on their Gray Ghost claim. It is double-compartment, square-set with 6 by 8's and lagged with 2 by 12's. The manway is one foot wider than the cageway in order to give ample room for pipe-columns and air-pipe. This group comprises the Gray Ghost, Baby Phil, New Year, and Anniversary mining claims.

Searchlight, September 14.

NYE COUNTY.

(Special Correspondence).—The sensation of the week is the finding of specimen ore on the property of the Manhattan Cowboy Mining Co. The strike was made on the western end of the Iron King claim on a vein just opened from the surface. Samples taken from the vein at a depth of 4 ft. assayed $15 per ton gold. The vein proved to be six feet wide, and at a depth of seven feet the specimen ore was found. It is the supposition that this vein is the same as that of the Union No. 9 and Little Gray. The quartz is identical, and the vein can be traced in a straight line across the hill to the properties named. The Cowboy Co. has 2,000 ft. on the vein. The ore now assays $75 per ton gold. The lessees on the Cowboy dug holes all around it, but missed the vein. J. Ness, a lessee, on No. 5 on the Iron King, sunk a 35-ft. shaft within five feet of this rich vein, and at that depth decided to cross-cut a short distance. It was done at random, and he decided to cross-cut north. Had he gone to the south, he would have had the rich vein within 10 ft. Ed Mulcoy and Jack Stinson found the new vein. Mulcoy took Lease No. 3 on the Iron King of the Cowboy Co. last February, and has been at work ever since. Stinson was put on the surface last week, and found the vein after a few days' work. Mulcoy, who was at work on the lease, told Stinson he knew about where this ledge cut through the ground, but was unable to find it. Another shift will be put on, and sinking pushed ahead rapidly.—— The adit on the Georgey group on the Manhattan Nevada Gold Mines Co., at Central, is showing up fine. Ore has been exposed in the face of the adit and in the face of both drifts, which are run from the adit. The ore in each place is of milling grade, and pans well, and there is a large quantity of it.——Two shifts will be put to work on the Georgey adit, as fast as a favorable vein is encountered, and new men will be put to drift on it.——The company's engineer is now on his way to Manhattan to go thoroughly over the Copper Farm and Eldorado claims of the Manhattan Nevada Gold Mines Co., with a view to selecting a suitable place—on one of the numerous veins that have been opened on that part of the company's holdings—to sink a shaft.

Manhattan, September 15.

Personal.

POPE YEATMAN is in Alaska.

F. W. BRADLEY is at Spokane.

E. HENRY DAVIES is at Teneriffe.

OSCAR H. HERSHEY is at Nome, Alaska.

HUDSON H. NICHOLSON is at Goldfield, Nevada.

C. A. V. BOHN is now a resident at Mexico City.

EDWARD SKEWES is examining mines in British Columbia.

NORMAN C. STINES is at Carrville, Trinity county, California.

HORACE W. OGILVIE is exploiting tin mines near Nome, Alaska.

E. J. HOWARD WRIGHT is on his way from London to Bolivia.

C. W. PURINGTON has returned to Denver from Eureka, Colorado.

WILLIAM L. COBB is examining mines in Kern county, California.

RUFUS M. BAGG has returned to West Springfield, Mass., from Mexico.

CHARLES BUTTERS sails for New York from Liverpool on September 27.

STANLEY CLAY, on his return to London from Siberia, has gone to Spain.

E. C. COLLINS has left Bisbee to take charge of mines at Tonopah, Nevada.

J. S. PRYOR is in charge of the Burra Burra copper mine in South Australia.

W. L. AUSTIN has been examining the Granby mine, at Grand Forks, B. C.

GELASIO CAETANI was in San Francisco this week, on a visit from Kellogg, Idaho.

T. C. OLIVER is superintendent for the Stanley Mines Co., at Idaho Springs, Colorado.

J. W. BENNIE, manager of the Shannon Copper Co., has returned to the mine from El Paso.

FRANK J. BOOTH has accepted a position with JOHN B. FARISH at Dolores, in Sonora, Mexico.

L. S AUSTIN, professor of metallurgy in the Michigan College of Mines, has returned to Houghton.

F. M. MILLER has resigned the superintendency of the Gaston mine, near Washington, California.

FRANK NICHOLSON has returned to Joplin, Missouri, from an extensive professional trip in the West.

JOHN ROSS, JR., consulting engineer for the Yellow Aster Mining Co., at Randsburg, Cal., is at the mine.

MARTIN J. HELLER, consulting engineer to the Nipissing mines, of Cobalt, Ontario, has returned to San Francisco.

CHAS. F. SELBY has been appointed chief chemist and superintendent for the Greene Con. Copper Co., at Cananea.

JAMES COUSINS has been appointed superintendent of the Doric mine of the X-Ray Mining Co., at Georgetown, Colorado.

FREDERICK S. HARRIS, of Chicago, has been appointed consulting engineer for the C. O. D. mine at Goldfield, Nevada.

JOHN THIEBES has been appointed superintendent of mines for the Oaxaca Exploration Co. in the Ejutla district, Mexico.

J. M. HYDE has resigned as professor of mining at the University of Oregon to take up professional practice in Mexico.

B. J. HEATH is in charge of mine development at the Heath mines for an Eastern company, near Rochford, South Dakota.

E. E. GARDINER has been appointed superintendent of mines for the Dominion Copper Co., at Phœnix, British Columbia.

CHARLES M. BECKER, manager of the Independence mine at Cripple Creek, has been visiting the mines of Grass Valley, California.

A. J. KLAMT has resigned as manager of the Mohawk Alpine mine at Silver Peak, Nevada, to represent Eastern interests at Rhyolite, Nevada.

FRANK ROBBINS, of Los Angeles, is at Nome, Alaska, acting in the capacity of consulting engineer for a Los Angeles company owning hydraulic property there.

Books Received.

NOTES ON METALLURGICAL MILL CONSTRUCTION. Edited by W. R. Ingalls. Published by *The Engineering and Mining Journal*. This volume of 256 pages is a reprint of articles bearing upon the most important details that enter into the construction of metallurgical plants. The articles appeared from 1902 to 1905 in the pages of our contemporary at New York and in some cases they were abstracted from the transactions of technical societies, but in their present convenient form they represent a mass of well selected and carefully edited material on an important branch of engineering practice. Among the contributors are many men who have achieved distinction in engineering work. In addition to his labor as compiler and editor of the volume, Mr. W. R. Ingalls is the author of many of the best articles, for mill construction is a subject on which he is particularly well qualified to write. The book is subdivided into seven parts, covering I, Brickwork and Concrete; II, Building Construction; III, Ore-Crushing Machinery; IV, Driers and Drying; V, Conveyors and Elevators; VI, Disposal of Tailings, and VII, Miscellaneous. The book is convenient in size and attractively bound. The price is $2 and it is for sale by the MINING AND SCIENTIFIC PRESS.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, September 19.

Con. Virginia	$0.88	Manhattan Con	$0.84
Ophir	2.75	Jumping Jack	0.53
Savage	1.25	Midway	2.30
Tonopah Ex	5.55	Montana	2.95
Belmont	5.75	Mohawk	4.50
Jim Butler	1.38	Silver Pick	0.71
Jumbo	1.43	Sandstorm	0.73

ANGLO-AMERICAN SHARES.
Cabled from London.

	September 13. £ s. d.	September 20. £ s. d.
Camp Bird	1 6 3	1 6 3
El Oro	1 9 0	1 8 3
Esperanza	2 18 9	3 5 0
Dolores	1 13 9	1 13 9
Oroville Dredging	0 19 0	0 19 0
Stratton's Independence	0 4 3	0 4 0
Tomboy	1 6 6	1 8 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.

	Average Prices for August	Closing Prices September 20.
Copper—Lake (cents per lb)	18.71	19 1/16@19 5/16
" Electrolytic "	18.38	18.885@19 1/16
" Casting "	18 1/8	18 3/8@18 7/8
Lead "	5.75	5.75
Spelter "	6.03	6.258@6.300
Silver (cents per oz.)	66.949	68

CURB QUOTATIONS—NEW YORK.

	Closing Prices Sept. 13.	Sept. 20.
Bingham Central	1 1/2	1 1/4
Boston Copper	29 3/8	31 5/8
Calumet & Arizona	16 1/2	16 1/2
Cumberland Ely	9 3/8	10 3/8
Dolores	8 3/8	8 1/2
El Rayo	5 1/2	6 1/4
Guanajuato Con	5 1/4	5 3/8
Giroux Con	6 7/8	7
Greene Con	25 1/4	27 7/8
Nevada Con	17 7/8	20
Nipissing	9 5/8	
Tennessee Copper	43 3/4	44
Tonopah Ex	5 1/4	5 5/8
Tonopah-Belmont	4.90	5.62
Tonopah	18 3/4	18 1/4
United Copper	63 3/8	66 1/4
Utah Copper	27 5/8	32 1/4

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

THE origin of petroleum oil is in doubt; some attribute it to volcanic action, others to segregation from organic matter in sedimentary rocks.

A MILL built at some distance from an unpatented mine may be considered as 'improvements' chargeable to annual assessment to the extent of $100 to each claim of the group.

MANY 'sandstones' throughout the world are built of volcanic material—that is, are composed of volcanic detritus, which has been carried by water or wind many miles from its place of origin.

CLEAVAGE in rocks is regarded as being largely due to compression. It has been computed that in the slates of Penrhyn the absolute compression has been such as to reduce a width of 100 to one of 43, or to about one half of their original volume.

GASOLINE engines may be employed for hoisting and for other purposes, underground, but the exhaust must be conveyed out of the mine by means of an air-tight pipe, as the fumes would prove an element of great danger if allowed to escape into the mine workings.

A TEMPERATURE of –60 to –80° F. is not dangerous to human beings who are properly clothed, if the air is still, while 30 or 40° higher, if accompanied by a gale of wind, would kill every living thing before it. Very low temperatures almost invariably coincide with perfect atmospheric quiet.

WHERE a vein or ore deposit has but one well-defined wall, it is often observed that as the ore gradually thins out along the strike, the wall not infrequently continues and ore is found on the opposite side of the fissure—the hanging wall of one shoot becoming the foot-wall of the next shoot, or vice versa.

UNDER no circumstances may anyone take up a mining claim on patented land, either agricultural or mineral, without consent of the owner. Mines worked on patented agricultural ground have no extra-lateral right and cannot acquire any by locating the patented agricultural land as a mining claim.

BITUMEN is occasionally found in volcanic rocks. A California instance is the occurrence of bituminous matter in a small fissure in rhyolite in Garfield cañon, in Calico mining district, San Bernardino county. This occurrence has led some to think it might be profitable to bore for oil there. The occurrence is too superficial and small, however, to justify any such expense.

THAT quartz is opaque is due largely to the myriad cavities which it contains. These cavities may be vacant, but often they contain water and liquified carbonic acid gas. Sorby discovered the fact that they may be so microscopic in size that a thousand millions of them in a cubic inch is not unusual, and the enclosed water often constitutes one to two per cent of the volume of the quartz.

A GOOD SINKING-PUMP will raise a large amount of grit and small rock fragments with the water, but this effect should not be taken advantage of. The suction end should be protected by a good screen of heavy wire netting, which will admit water to the full capacity of the pump, while keeping out the grit, to a great extent. Neglect to make this provision causes great and unnecessary wear on the pump valves and also upon the barrel of the pump.

EGYPT was the California of the ancient world. The kings of Assyria and Babylonia obtained their gold from the Pharaohs. A papyrus has been found describing the mines of Akita in the eastern desert, which were reached from the Nile at a point near the modern Dakka. A great mining people lived in the mountains between the Nile and the Red Sea in the days before the Ptolemies. Scarcely a trace of them survives but the gold mining industry has been revived recently by Englishmen.

IN chloridizing roasting the material (ore or matte) is roasted with common salt, the metal to be extracted being converted in the roasted material to the form of chloride. For successful chloridizing roasting it is necessary that a certain percentage of sulphide be present, that upon oxidation the sulphur may attack the sodium chloride, freeing chlorine gas, which then acts upon the metal to be extracted—usually silver, though gold, copper and other metals are also affected.

THE first vessel to navigate the great lakes was the *Griffon*, built by La Salle and his party in 1679, near the site of the present city of Buffalo, on Lake Erie. The *Griffon* was about 50 tons burden, and carried La Salle with 34 men and five guns safely from the point where she was built to Mackinac, and thence to Green Bay. She started to return with a cargo of furs in the following year, but was lost, probably on Lake Huron. From the 50-ton *Griffon* to the 7,500-ton iron ore carrier of today is a long step.

NOT infrequently, in mining in the zone intermediate between completely oxidized ore and the sulphide, pyrite or other sulphide appears in the wall-rocks before it is noticed in the vein itself, probably due to superior opportunities for the passage of surface water within the vein with consequent oxidation of the sulphide. The fact that the pyrite of the walls is relatively barren of precious metals is no indication of similar poverty of the sulphide in the vein, for it is only rarely that the pyrite of the vein walls contains more than a nominal amount of gold or silver.

COBALT, in the form of erythrite (hydrous cobalt arsenate) is found in small amount in the Kelsey silver mine in a heavy-spar gangue. This mine is in San Gabriel canyon, five miles north of the town of Azusa, in Los Angeles Co., Cal. It was worked about 14 years ago and at that time produced some very rich silver ore, much of it being native silver. Cobalt ore is also found in the Josephine mine on the Mariposa estate, owned by the Mariposa Commercial & Mining Co., three miles north of the village of Bear Valley, Mariposa Co., Cal. The mineral in the latter instance is danaite, a sulpharsenide of cobalt, and erythrite, as a result of decomposition of the former.

EL COBRE copper mines, of Santiago, Cuba, were worked by the old English and Spanish companies within an area of about 1.5 by 0.25 miles, the old workings being represented by numerous open pits and more than 40 shafts, most of which were of shallow depth only, and several, according to old records, were bottomed in good ore at the time the mining operations were suspended. Beyond these old surface-workings the gossan outcrop continues strongly for several miles easterly along the strike of the formation. The copper-bearing rock of the region is of volcanic nature, a tufa, usually highly decomposed near the surface, but often showing a brecciated or conglomeratic structure.

Discussion.

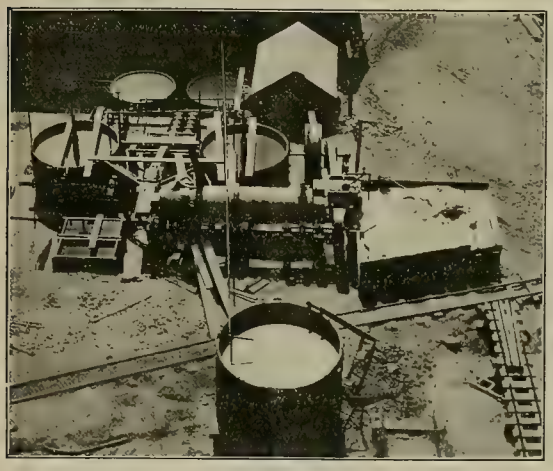
Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

About Foremen.

The Editor:

Sir—The communication by 'Miner,' in your issue of August 11 under the caption 'Too Perfect for Use,' called to mind some correspondence which passed not many years since between a large operator in the Pennsylvania coal-fields and a mining engineer of that State with whom I was at the time associated. The operator was the owner of four large mines which, from the nature of the seams, were easy to work, and being one of the 'old-school' type of men with whom rule of thumb methods (?) prevailed, had never employed a regular mining engineer to keep up mine surveys closely and to provide accurate and elaborate maps, thinking such refinements altogether too fine-spun and expensive for the prosaic business of mining coal.

But one day the inevitable happened. By reason of guess-work in the matter of locations underground a bad accident happened; besides causing a serious financial loss in the mine itself, a number of men were injured,



Experimental Cyanide Plant.



Another View of the Same.

and the old gentleman was mulcted about $10,000 in damages awarded by the courts, it being shown that the fault lay with the operator in not providing accurate maps of the working places.

It then occurred to the operator that he had better have regular surveys made and he wrote to the engineer above referred to, asking him to recommend someone for this work. He stipulated in his letter that he wanted a young man of good qualifications as a surveyor and draughtsman, one that did not use tobacco or liquors in any form, one whose language should at all times be innocent of profanity, and that when not engaged in keeping up the surveys and maps required, should be at the call of the inside superintendent for any work he might want done, and if this did not fully occupy his time, that he should assist the outside superintendent or the head book-keeper at the office. He did not state that he wanted him to teach a class in the Sunday school, lead the church choir, and take an active part in the Christian Endeavor and Wednesday evening prayer meetings, but from our knowledge of the man, it was fair to expect that it would come to this in time. For a young man possessing these qualifications he was willing to pay $40 or $45 per month, and he earnestly desired the engineer to secure such an assistant for him.

The engineer replied, "My dear Mr. Brown, the boys who would fill your bill are all dead, and no more are being born. Yours respectfully, Smith."

The following day, however, the engineer wrote the old gentleman a long, 'fatherly' letter advising him what he should expect of a man for the place to be filled, that he should get a man simply and solely for engineering work, not forgetting to remind the operator that he knew full well the disastrous results of incompetent or inadequate work, and advising him that he thought he could get such a man for about $3,000 a year. It resulted in the operator's employing a man such as the engineer recommended at a salary of $2,500, and no questions asked about the frills.

Since that time, so far as I have heard, there have never been any serious accidents at any of the four mines in question, due to imperfect mine maps.

The moral is that men about mines should be selected for their fitness for the particular work they are held responsible for, and when they fill this bill, they give value received for their wages. Any extra accomplishments they may possess in the way of tact, dignity, and social polish may be useful in advancing them to other positions, but the chances are that such a paragon as the the one described in your extract from 'The Business of Contracting,' or as that specified by the Pennsylvania mine operator, when it comes to the real hard knocks incident to the business of 'getting there' in everyday work, will be found 'too perfect for use.'

A. B.

New York, August 30, 1906.

Tube-Milling in Korea.

The Editor:

Sir—We are at present experimenting on a practical scale with re-grinding our concentrate in a tube-mill with cyanide solution. It occurred to me some months ago that cyanide solution could be used just as well as water, when reducing our concentrate to slime, and incidentally some of the gold could be extracted while grinding. In other words, the tube-mill could be used as a grinder and agitator combined.

This company (Oriental Con. Mining Co.) has constructed an experimental plant consisting of one tube-mill (2½ by 12½ ft.), two mechanical agitators with plow shoes (8 by 6 ft. diam.), three filter and settling-boxes (4 by 5 by 5 ft.), 48 separate-compartment zinc-boxes, two sumps, and one stock-solution vat. An electric motor furnishes

the necessary power. The tube-mill was constructed in this company's shops.

The method is a continuous one; the concentrate is put into the hopper with cyanide solution and upon passing through the tube-mill is nearly all ground to slime and a good percentage of the gold is extracted. At the end of the mill is a spitzkasten (3 in. wide by 1½ ft. long by 1½ ft. deep) supplied with clear water from the bottom. What discharges from the bottom of the spitzkasten is coarse concentrate and clear water, that passing over the spitzkasten is the cyanide solution and slime. The coarse concentrate that may escape from the tube-mill is caught in the settling-boxes and again re-ground, while the overflow contains very little value (tests 0.005 to 0.01% KCN and assays six cents per ton). We cannot arrange to run this overflow or waste-water solution through a separate line of zinc-boxes. In this small plant the value of this waste solution will not amount to more than $2 to $3 in 24 hours. The slime concentrate and cyanide solution pass on to an agitator which has been set in motion (13 rev. per min.) and the muller lowered. Here the product is agitated for about 15 hr., the muller is then raised two feet, the agitator stopped and the concentrate allowed to settle. It takes about one hour to settle clear; by the addition of some milk-of-lime it could be made to settle in half an hour. I prefer to use as little lime as possible because the strong alkaline solution consumes a large amount of zinc. The clear cyanide solution is decanted by a float siphon into filter-boxes and from there it is run through the zinc-boxes and the gold precipitated. Next, the strong precipitated cyanide solution from the sump is pumped up to the agitator as a wash to partly remove the gold remaining within the settled concentrate. The muller is allowed to work down on the charge and agitate for a few minutes, then settled and decanted. Following this come two successive weak cyanide washes to remove cyanide and gold, and finally a water-wash which is run through a row of zinc-boxes to waste. Now the charge of about five tons of clean concentrate is ready to be discharged into the creek. A little water is added, the muller set in motion and lowered, the discharge-hole opened, and now the agitator will discharge itself readily and prepare for a new charge. The total treatment takes 24 hours, both agitation and decantation being done in the agi tators.



Tube-Mill and Experimental Cyanide Plant.

By feeding the concentrate and cyanide solution with a consistence of one to one through the tube-mill, we are able to get the finest grinding and the best results. The agitators will only have to be filled once to contain a full charge. While one agitator is being filled, the other is decanting and getting ready to be discharged. At the head of the launder (leading from mill to agitator) a pipe was run to the stock cyanide vat above, so that we can add enough solution to keep the launder clear. With clean concentrate, it is necessary to have a steep grade.

The strong cyanide solution (0.43%) is used in the tube-mill and agitators, while the weak one—employed for washes—tests 0.1%. No cyanide is added to the weak solution. Lime is added (about two pounds per ton) with the concentrate as it is fed into the mill.



Taracol, Korea.

The old method of cyaniding concentrate here is by mixing with 48% sand and percolating in vats from 20 to 30 days. This method gives an average extraction of 80%.

The extraction obtained at present with the tube-mill and agitators on clean concentrate is 93%. By

gradually making improvements we may possibly better these results.

A. E. DRUCKER.

Chittabalbie, Korea, July 20, 1906.

A Confusion of Terms.

The Editor:

Sir—It is time that somebody was protesting against the misuse of such common appellations as 'mining man,' 'cyanide man,' and the like. Such terms are discreditable to the profession, and confusing to the layman. The scaliest of promoters, the wily stockbroker in the booming mining camp, ensconsed behind his spider-web of fraud, the 'new process' man on the track of the promoter-manager, all are, without distinction, called 'mining men.' The layman usually discriminates more intelligently. He never confounds a lawyer with a doctor, a mere 'healer' with a genuine Christian Scientist! But all men who talk mines or think mines are 'mining men' to him. He does not hesitate to accost the respectable mining engineer with such jaunty greeting as "How's things looking in the new camp?" or "What's the tip on Happy Girl or Bullfrog Jim?" By the same token, the drummer assumes that every passenger he sees on the train "carries a line of goods." The time is ripe for the enlightenment of the layman. The distinctions should be clear and sharp, and I cheerfully offer the following classification to the consideration of the laity and mining public: (1) Mining engineer: the technical graduate; (2) mining engineer: the man who has won his title from experience, and if not prejudiced, may be a good man; (3) mine owners: these are often their own engineers; they make many mistakes and squander money that should be devoted to dividends; (4) mine managers: a class susceptible of about ten subdivisions, too varied and picturesque to admit of brief description; (5) promoters: men whose business it is to sell a mine and let the future take care of itself; they have usually tried other lines of work and failed, like insurance agents, and presidents of miners' unions; (6) metallurgists: who may be divided into those who have a process to dispose of, and those who dispose of processes; (7) brokers: a species of human spider, called by their friends 'mining men' to disguise their real vocation; finally (8) the 'mining man' who decorates brokers' offices and cigar stands with his imposing person, and is sometimes reduced to working for a living.

The above classification is simple and may be easily memorized.

There is another class of expert known as 'cyanide man.' The title has a wide range—from the metallurgical engineer down to the man who shovels out sand-vats. The 'cyanide man's' supreme hour of triumph is when he passes from the stage of 'solution man' to engineer, and advises his company to treat all ores by the cyanide process, because it happens to be the only thing he is conversant with. Fatal mistakes due to such narrow specializing are common enough. In these days of electrically rapid changes and merging of processes, no more latitude should be allowed the 'cyanide man' than the amalgamating man, the concentrating man, or the tube-mill man. The well-equipped metallurgist should be conversant with all processes, and be able to estimate the value of each in its proper proportion. The term 'cyanide man' is destined to short life. But even if it live, why saddle upon a harmless individual a designation so horrific and one so apt to prejudice the timid layman; and why indulge in such vulgarities as 'mining man' when we may so easily designate the varieties? We do not say 'doctor man' or 'lawyer man'; and yet it is common enough to speak of the gas man, the vegetable man, the garbage man! With the introduction of phonetic spelling, a reform in professional mining nomenclature is distinctly in order.

OBSERVER.

Denver, September 2, 1906.

Siberian Concessions.

The Editor:

Sir—Anent the subject of Siberian Concessions in your issue of August 18, it is interesting to note the inevitable complication of another concessionaire as indicated through the Imperial intimation of the gentleman at the Imperial Russian Consulate of San Francisco. As I myself was the accredited engineer of the 1900 expedition of the East Syberian Syndicate, Limited, whose work was prematurely ended by the impossible attitude of the incompetent Russian official in charge of that expedition, I have watched with much interest the affairs of the successors to the Tchouktchi concession. This concession was arbitrarily canceled and made forfeit as the result of differences that arose between the Anglo-American and Russian officials of the expedition mentioned. It occurs to me that the Imperial intimation published might fairly be seconded by other data which have been developed at the expense of the concessionaires to the territory specified, namely:

1. That in the Tchouktchi peninsula there have not been made, neither through company expeditions nor through the labor done and untold hardships endured by lessees, any discoveries of gold of any importance; on the contrary, though similar geological conditions extend from the Alaskan peninsula to the corresponding Siberian land about East Cape, the rivers, gulches and beach-sands of the Russian side have proved comparatively barren of gold.

2. That the successors to the East Siberian Syndicate, Limited, did develop some salmon fisheries to such an extent that these fisheries became the main asset of the new company; and it must be these same fisheries that were gracefully conceded by the Imperial Russian government to Japan by the terms of the memorable treaty of Portsmouth.

"In the interests of all parties concerned" it is well to give warning of the trickery that is thinly veiled in the formal communication of the consular servant of Imperial Russia.

FORBES RICKARD.

Denver, August 27.

'GUDGEONS' are the metal journals of a horizontal shaft, such as of a water-wheel. For moderate speeds we may calculate,

$$\text{Diameter in inches for cast-iron} = \frac{\text{weight in pounds on the gudgeon}}{20}$$

If the gudgeon is to be of wrought-iron add one-twentieth to this diameter. The pivot, or lower end of a vertical revolving shaft, should be flat, and both it and the step or socket upon which it rests, should be of hard steel. If it has to revolve rapidly and continuously, it is well to proportion its diameter so that it will not have to sustain more than 250 lb. per square inch; otherwise it will wear quickly. Dust and grit should, for the same reason, be carefully guarded against. Pivots which revolve but seldom and slowly, as those of a railroad turntable, may be trusted with half a ton or even a ton per square inch. As a general rule cast-iron pivots should be trusted with but half the load of steel ones. A steel one may be inserted partly into its cast-iron shaft, and the whole strengthened by bands shrunk on.

TRULY it has been said, that to a clear eye the smallest fact is a window through which the Infinite may be seen.

Directions for Working Rock-Drills.

The rock-drill, above other machines, is the most subjected to rough treatment, the more so underground, where, because of the bad light and want of space, and also from the inexperienced hands in which it is often placed, it gets more knocking about than is good for any machine, not constructed on the soundest model and of the strongest material.

In some kinds of rock the bit is very liable to stick, and then the workman hammers at it or upon the body of the drill with whatever first comes handy. A blow from a hammer is the quickest way to release a drill, and will do no harm to a first-class machine, but the blow should be given to the steel, and not, as often happens, on the piston rod or machine itself. To illustrate; an instance is given by Davies, who in using machine-drills in a mine in the south of France, where the miners were a hot-headed mixture of Spanish and French blood, had trouble, arising from the men, when the bit stuck, striking the front-head (stuffing-box) of the drill and often breaking it, perhaps accidentally, perhaps maliciously, since such a break would create a delay arising from the necessity of changing machines. In that particular mine it happened that the miners were much against the introduction of machine labor for stoping. In fact such was their opposition that the drills were set to work under police protection, but, notwithstanding all precautions, the first man who undertook to run one was assassinated, and the roof of the underground superintendent's house was destroyed by dynamite. This opposition arose from their idea that they would be thrown out of employment as soon as rock-drills were set to work.

It is difficult to find and train men well fitted to the work of running a drill. What is wanted is a man of an energetic, ingenious turn of mind, possessed of much patience, who will take pride in overcoming difficulties in his way, and who will not be happy until he has done so. At first, such a man may lose time by puzzling over the job, but, once he gets to know his machine, he will not readily be put in a fix. It is always advisable to have a man available to instruct others when they begin this work. As soon as a drill needs repair, or refuses to work, it should be sent to the surface, as it is a loss of time to undertake to repair it underground, and one is liable, in so doing, to lose some of the fittings.

The machine-man must know how to point his holes and how to fix his support where it will enable the drill to command the greatest number of holes. In operation, if a column or shaft-bar is to be used, place a block of wood between the rock and one end of the bar, though a block at each end is always to be preferred. Fix the bar firmly and rigidly between floor and roof or the walls by means of the jack-screw. Now clamp the drill tightly on it in the required position and square off the rock, where the drill is to enter, at right angles to the travel of the bit. This should be carefully attended to, especially in hard fissured rock, since the bit, under the heavy blow, will glance aside, and not cut down the edge of the hole in line with the travel of the bit. This deviation, if not attended to, will gradually carry the bit so much out of line as to waste the whole effect of the blow in friction, whereupon a bit of smaller size must be inserted. In fissured and troublesome rock, when the drill is allowed to get out of line at the start, it will often cause trouble throughout the entire hole, while *a hole well started is half drilled.*

When the face of rock has been squared, and everything is ready for a start, put in the shortest bit, which will permit a good travel of the feed screw, draw out the piston-rod until the piston strikes the bottom of the cylinder, and screw forward the drill until the bit touches the rock, then give the feed-screw a couple more turns. To fix the bit in its chuck all that is necessary is to force back the piston-rod, then draw it smartly forward, striking the bit against the rock. Then tighten the U-bolt nuts. Permit air to blow through the hose to remove any dirt or grit which may have accumulated, close the throttle-valve, pour two tablespoonfuls of oil into the coupling, bend the hose and connect it to the machine. Oil the rotating gear by removing the screw-plug upon the top cover and the machine is ready to start.

Turn air into the hose from the mains, half-open the valve, when the machine will start and at once begin to cut the rock, and, as the bit penetrates the rock, the machine must be correspondingly fed by the feed-screw. When four to five inches have been drilled, turn on full air, pour water freely into the hole and keep turning the screw-feed as the hole advances. When the short drill has cut as deep as it will reach, shut off the air, get the machine back by means of the feed screw, remove the bit and replace it by the next longer one. Strike the first few blows at half-pressure to bring the bottom of the hole to the shape of the drill, then proceed at full speed as far as that bit will allow, when it in turn must be replaced by a still longer one, and so on to the depth desired.

In running a new machine-drill *with steam*, it may happen that it will not start readily, or at first to work slowly. This is caused by the unequal heating of the cylinder and will disappear as soon as the machine becomes uniformly heated. When starting either a new machine, or one which has been laid aside, pour a half-pint of coal-oil into it to remove the gum of the old oil, and, after a few minutes' run, oil with a good suitable oil. Keep the machine properly oiled, take care of it, and you will find it the miners' most useful tool, and one which will last for years with trifling repairs.

To those who are practically conversant with metallurgical operations no argument need be offered as to the value of properly made calculations concerning the running of a process. If ever rule-of-thumb is to be placed in a metallurgical process by scientific operation, the change must be based upon experiments, classification of results, and calculations therefrom. The principles involved are physical, chemical, and mechanical; the scientific metallurgist must master these, use them as tools, and overcome brute nature by their skillful employment. Every metallurgical problem is an exercise in pure logic and mathematical reasoning; the premises are observed facts—all that can be learned of the process by direct observation and measurement; the conclusions desired are everything which can be deduced from the process by hook or by crook, by direct logical process or by inference. In this way data and information are obtained, which cannot be directly observed or measured, and which are of the most essential value for thoroughly understanding the process.—Jos. W. Richards.

The Most Powerful Locomotive.—What is said to be the heaviest passenger engine ever built has been delivered to the Lake Shore & Michigan Southern Railroad. It weighs 244,700 lb., of which 170,000 are on the driving wheels. The engine and tender weigh 403,700 lb. and the capacity for water is 7,800 gal., while that for coal is fifteen tons. This powerful locomotive was designed as a step in the development of large passenger locomotives on the Lake Shore road, which began about seven years ago, as a result of which this road has a series of successful designs. The Walschaert gear has been generally adopted because of favorable experience in both freight and passenger service. The new locomotive is entirely free from untried devices or principles.

Three Weeks in Mexico---IV.

Geology of the Mines at El Oro.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

From Mexico City I went to El Oro. This mining district is 90 miles northwest and while most of it is within the State of Mexico, its northern portion extends into the adjoining State of Michoacan. At the time of my visit (October, 1905) El Oro was attracting much attention; a new orebody in the Esperanza had sent up the shares (of the company owning that mine) in London; El Oro Mining & Railway Company shares had risen in sympathy; Dos Estrellas was making a boom market in Mexico City; and Victoria y Anexas was fluctuating in a manner beloved of speculators. As a foundation for such financial activities, I found lodes of unusual geologic interest

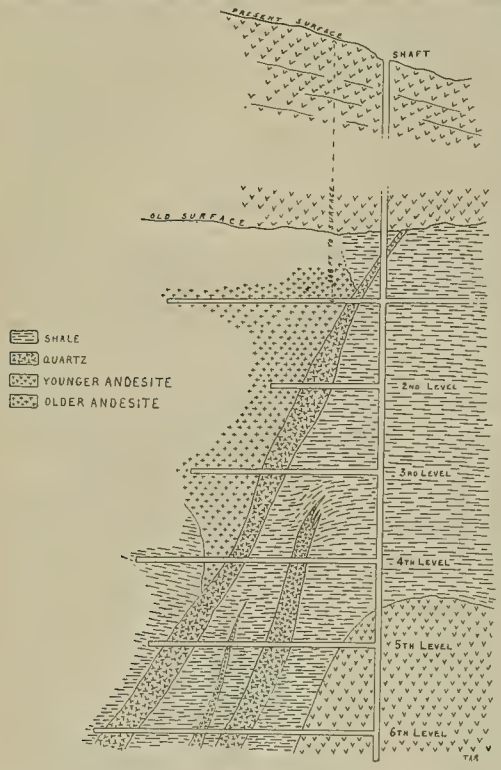


Fig. 1.

and a metallurgical practice that represented the sum of great technical ability.

The mines are situated on the slopes of a ridge that rises 600 ft. above the valley, through which runs the old main line of the Mexican National Railway. On the near (eastern) side are the Mexico, Esperanza and El Oro mines; on the further slope is the Dos Estrellas. The three mines first mentioned follow a series of veins of which the San Rafael is chief; these dip into the mountain. The Dos Estrellas on the other side also dips to the west. The bush-covered summits of the ridge consist of an andesite lava, while the mine workings are mainly in shale. A covering several hundred feet thick of (probably Pliocene) andesite is spread over the ancient eroded surface of a (probably late Cretaceous) shale, in which occurs a series of quartz lodes, containing gold and silver. The cap-rock forms part of an extensive extrusion of volcanic material, the main vent of which is not known; although in the mines there have been encountered tongues and irregular bodies of the same rock, suggesting many minor places of emission. The shale is thinly laminated, black, and calcareous; it contains occasional layers of limestone. According to Robert T. Hill, it is the formation in which occur many of the best mining districts of Mexico. The relation of the cap-rock, the shale, and the quartz lodes is seen best in the Mexico mine, which, being a young property, is easily accessible throughout. The accompanying cross-section (Fig. 1) through the main shaft is based upon a tracing given to me by Mr. Fergus L. Allan, superintendent of the mine.

The shaft goes through the andesite of the cap-rock for nearly 600 ft. and then penetrates the shale. After passing through this shale for 450 ft., the shaft encounters andesite and continues in that rock to the bottom, just below the sixth level. This andesite, in the foot-wall country, is the same rock as the cap, and is evidently younger than the vein and, therefore, later than the other andesite which overhangs the San Rafael vein, as seen in the first four levels west of the shaft. Some distance west of the San Rafael vein in the Nolan mine, narrow

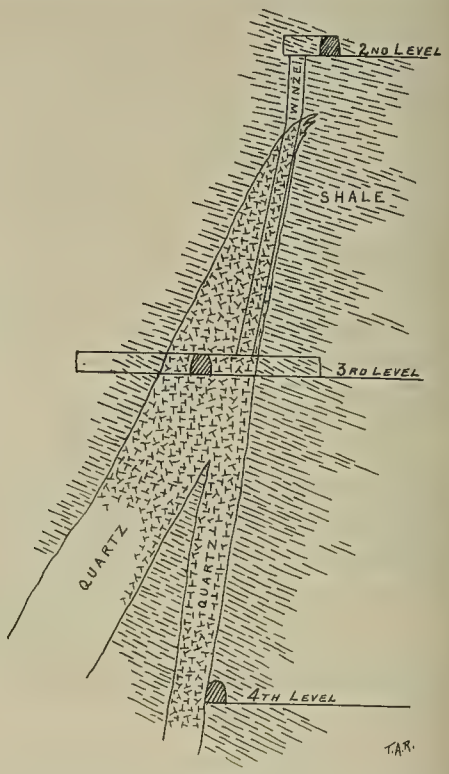


Fig. 2.

intrusions of this younger andesite have been found running at right angles to the course of the vein. The deeper levels have not found the older andesite on the hanging wall; it antedates the vein, for mineralization extends into it. The same tongue of andesite occurs in the northern workings of the Esperanza and in the same position relative to the vein. In some places ore has been found in this andesite, where it is adjacent to an orebody in the vein.

The lode consists mainly of banded quartz, built largely of rock in place, which has been shattered and silicified, the whole body attaining a width of 30 to 50 ft. The ore occurs in pay-streaks along the walls of the vein, in some places combining and occupying the larger part of the space between. This quartz contains just enough iron oxide to color it; when banded it is always good, the poor portions of the vein being characterized by massive white quartz. The shale adjoining the vein is bent and shattered, it shows numerous streaks and small veins lying parallel to, and running into, the main vein. That portion of it which is found at the old surface of the shale has a width of 30 to 40 ft.; it had evidently undergone erosion before being covered by the later andesite capping.

As a rule where the apex has been thus exposed to weathering, the San Rafael vein is richer than usual; it has undergone a noteworthy concentration. In the southern portion of the Mexico mine the apex of the vein is found at the surface of the shale, but further north the vein stops 100 to 250 ft. below the old surface of the shale. When the vein does not reach the old surface, it frays out into stringers, bent over at their ends, as shown in Fig. 2. This particular vein carries an average assay-value (11 dwt. gold and 6 oz. silver) right from the start; it widens until, at the fourth level, there is 25 ft. of quartz; on the second level, only 25 ft. above its blind apex, there is no indication whatever of the proximity of a vein.

The conditions just described as occurring in the Mexico mine are found in the Esperanza and El Oro workings, which extend in sequence southward.

As seen in El Oro mine, the veins really constitute one big lode-channel with portions of country between, that

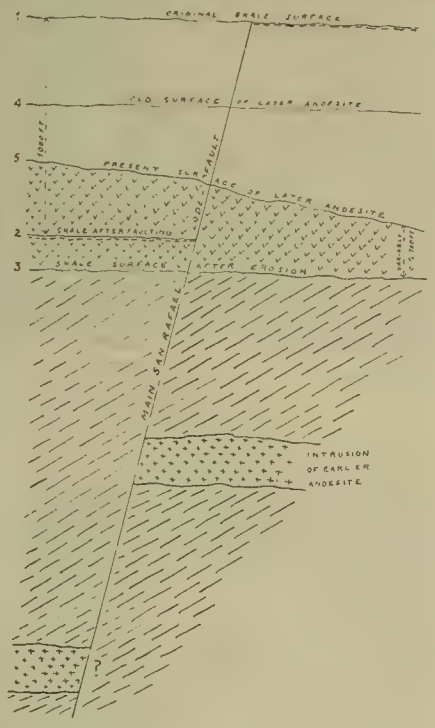


Fig. 3. Diagram Showing the Series of Geological Events Which Brought About the Present Structure. Cross-Section of Northern Portion of Esperanza Mine.

is, the distinction between what is ore and what is worthless quartz is purely commercial, based on assays, and not upon geological or structural distinctions. At first the Branch vein, one member of the system, was found to be rich enough to exploit; then a smaller streak on the hanging wall of the big Main vein (the San Rafael) was worked, and finally the foot-wall portion of the San Rafael was stoped, to be followed by various subordinate members of the series, as they were determined to be rich enough in gold and silver, to more than meet the costs of mining and milling. A typical cross-section of the lode-channel shows sundry branch veins, then the foot-wall orebody of 35 ft., then streaks up to 3 ft. wide between the foot-wall ore and that of the hanging, which is 40 ft. wide; finally, beyond these there is the Branch vein, 5 to 18 ft. wide.

At the north end of the mine the orebodies of the foot and hanging are separate; they come together in a distance of 700 ft. and form one width of 80 ft., which is maintained nearly to the south end of the shoot, in the vicinity of the incline shaft. The ore on the hanging is fairly uniform in value across its full width, the foot-wall ore is best on the hanging side; even after they unite the individuality of the streaks is maintained. When the bands of pay-ore in this mine terminate they do so first by narrowing and then by the splitting or fanning out of the mass of quartz that contains them. Divergent streaks connect the various orebodies, and some of them are rich enough to be stoped. The whole lode-channel is

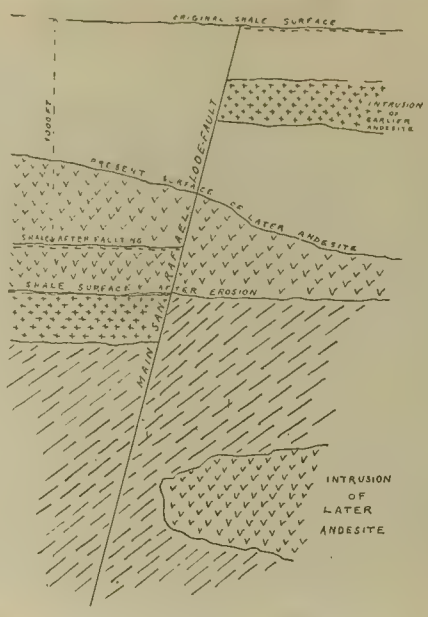


Fig. 4. Lode Fault, San Rafael Vein. Cross-Section of Southern Portion of Esperanza Mine.

interrupted at intervals by a succession of faults dipping at 65° to 70° except the southernmost or diagonal break which is 35° ; all of them dip north.

Water was first struck in El Oro mine at 425 to 430 ft. below the cap—for all measurements are made from this old surface. Maximum water was encountered at 1,200 ft. The Somera shaft began to show a heavy inflow be-

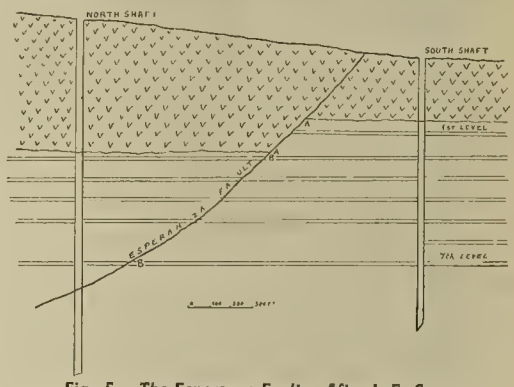


Fig. 5. The Esperanza Fault. After J. E. Spurr.

tween 786 and 1,000 ft., especially from 900 ft. down; the water came in along stringers on the hanging-wall side of the lode. At 1,000 ft., the cross-cut (90 ft. long) to the lode cut more water along other veins, so that when the lode was finally struck there was no great addition to the inflow. The water in the workings on the main lode remained at the 786-ft. level until the lode itself was cut at 1,000 ft. The faults appear to be impervious and serve as barriers; each block has to be drained

separately. At the end of the rainy season, surface-water makes itself felt in the mine, but only in the northern workings, where it seeps down through cracks in the cap-rock caused by mining operations, more particularly the large stopes on the San Rafael lode made by the Esperanza and El Oro companies near their common boundary. The rainfall apparently does not affect the inflow of water in the deep workings, the mine-water (except in the case above noted) having no direct connection with surface.

In the Mexico and El Oro mines there is some geology, which is not particularly complicated; but the ground between, occupied by the Esperanza mine, presents many intricate problems.

There is a good deal of geology in the Esperanza, and there is a good deal of rich ore. The geological features have been carefully studied by Mr. J. E. Spurr, and the data embodied in my notes are largely the result of his work, in association with the management. The accompanying diagrams (Fig. 3, 4, and 5), and the geological plan of the second level, as given in Fig. 6, are based on sketches and a blue print given to me by Mr. W. E. Hindry, the manager. To him and to Mr. W. H. Haynes, the assistant manager, I am much indebted.

The main geological events, the results of which are evident in the mine workings, are:

1. The deposition of the shale.
2. Intrusion of andesite in the form of dikes and sills.
3. Faulting, involving several dislocations, one of which became the channel of the San Rafael lode, and later movements that displaced it.
4. Deposition of ore by waters circulating along the channels made by the previous fracturing.
5. Eruption of a later andesite that overflowed at surface and penetrated the shale formation.
6. Cross-faults.

In Fig. 3 the San Rafael lode is shown as seen in cross-section, looking northwest, in the northern portion of the mine. The sequence of geological events is indicated by the numbers 1 to 5. First, the shale was ruptured and dislocated at least 1,000 ft.—from 1 to 2. Then it was eroded and on it was spread the andesite, the original surface of which at 4 was reduced by erosion to the present surface at 5. The thickness of this andesite cap ranges now from nothing up to 700 ft. In the meanwhile the intrusions of earlier andesite were also faulted with the shale, as is suggested by a tongue of that rock indicated on the diagram. In Fig. 4 the same sequence is exhibited as is seen in a cross-section of the southern end of the mine. In this case a higher intrusion of earlier andesite is shown and also a tongue of later andesite.

The lode, therefore, follows a big fault; but it is itself faulted, as shown in Fig. 5, which is a longitudinal projection N. 60° E., magnetic. On the first level at a point 525 ft. north of El Oro boundary, this fault cuts through the country and displaces it, as measured by broken ends of intruded older andesite, 500 ft. vertically. This same fault is evident at the surface of the shale (now buried under later andesite), for there is a drop of 160 ft. in the bottom of the cap-rock. This would appear to indicate that the movement transverse to the lode continued after the later andesite overflow, so that in the main fault, the total dislocation is measured in two parts, two-thirds or about 340 ft. of which occurred before the cap-rock was formed, and one-third, or 160 ft., after that event.

In the mine the lateral displacement of the San Rafael lode is 130 ft. to the right. At the south shaft the cap is 284 ft. thick; near the north shaft it is 165 ft. higher (by reason of the rise in the ground in a length of 1,600 ft.—the distance between the shafts) plus the fault (160 ft.), plus the elevation, making the present thickness 165 + 160 + 284, or 619 ft. South of the fault the lode is entirely in shale all the way down to the fifth level; just below that horizon there is andesite on the foot-wall and shale on the hanging. North of the fault, the first level penetrates cap-rock, while the second has shale on the foot and the older andesite on the hanging. The third and fourth levels repeat the conditions observed on the second. At the fifth (still north of the fault) there is a change; at about 100 ft. in the foot-wall the newer andesite (which is the cap-rock) appears at 500 ft. north of the fault and thence to the boundary of the Mexico mine. At the sixth level the older andesite shows in the foot-wall south of the fault and appears to be the top of an intrusion, while north of the fault shale appears on both foot and hanging, that is to say, we have the conditions which exist south of the fault 500 ft. overhead—which is the measure of the dislocation. On the seventh level the older andesite appears along the foot-wall up to the fault, shale showing in the hanging. North of the fault the lode is in shale as regards both walls, with the

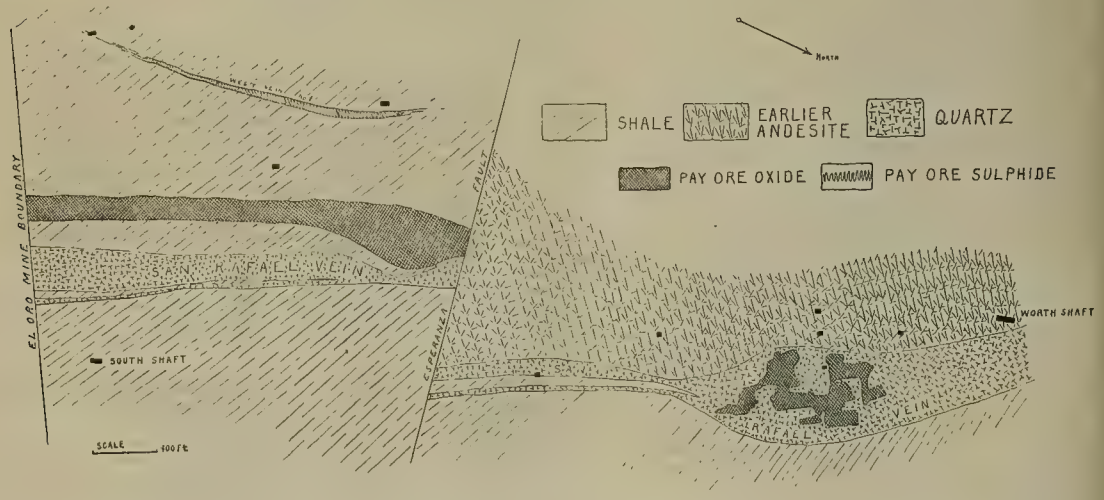


Fig. 6. Plan of Second Level of Esperanza Mine.

Geology by J. E. Spurr. Drawing prepared by the author from map by W. E. Hindry, mine manager. The apparent anomaly in geological conditions—the andesite being absent on the south side of the fault—is explicable by the fact that there has been a vertical displacement, as well as the horizontal movement indicated. Comparison should be made with Fig. 1, this section of the Mexico mine being taken 800 ft. north of the ground shown in Fig. 6.

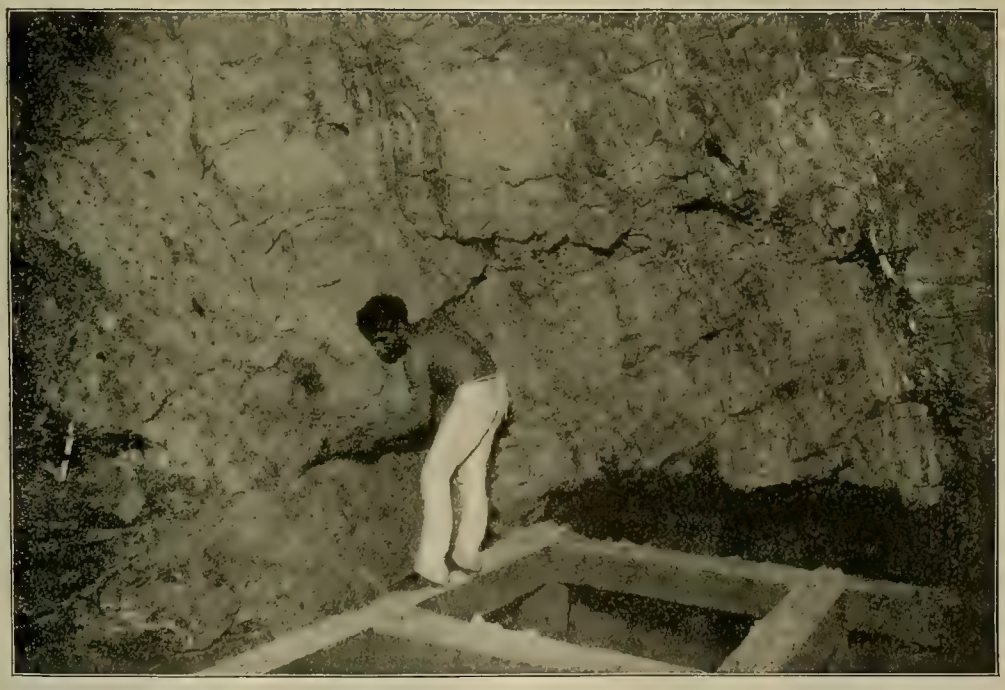
newer andesite in the foot-wall country (150 ft. east of the lode) near the Mexico boundary. At this same level—the seventh—the newer andesite (or cap porphyry) occurs in the form of an east-west dike, 153 ft. thick, at a point 825 ft. west of the lode, but its real shape has not been ascertained.

All this refers to the San Rafael, the main lode of the Mexico, Esperanza, and El Oro mines. The interesting problem, during my visit, was whether the new West vein is faulted (See Fig. 6) in a manner similar to the San Rafael or whether this bonanza vein is younger than the fault itself. If the latter be the case, the vein would go into the andesite north of the fault at the third, fourth, and fifth levels. The ore of the San Rafael extended up



El Oro, Mexico.

El Oro. *Esperanza.* *Mexico.*



No. 1 Sulphide Vein. Third Level. Esperanza Mine.

to the fault, the break being clean. At the fifth level pay-ore was broken almost up to the fault-line. The San Rafael is generally more broken on the north side, the ore not reaching up to the fault as clearly as it does on the south side. If the West vein be later than the fault, it is likely to be weak where crossing the latter and probably it will be less rich in the andesite than in the shale, the bonanza portions of the veins of El Oro district being in shale country. With the limited data at my disposal, it seems to me unlikely that the new vein is younger than the fault, because there is no evidence of its existence in the northern workings.

The new Esperanza orebody was a sight to gladden the eyes of a miner. It is 680 ft. long, with an average width of 9 ft. and an average yield of 75 grams gold (or $49.70) per ton and 1,150 g. silver ($19.55) per ton. The shape of it is roughly lenticular; it is widest about the centre and comes nearly to a point both north and south; in depth it is shaped like the bottom of a boat, with protruding keel. Where first cut on the fifth level, there were two veins close together—the first assayed $1.50 to $2 per ton, while the other, No. 2, to the west, went $75 per ton. Subsequent stoping gave a different story; the No. 2 has been payable only for 50 ft. above this level, while the No. 1 gets into rich ore three feet above and only 15 ft. south of the cross-cut.

At about 45 ft. south, the two veins come together and make a width of 35 ft. of ore worth over $100 per ton. The moral is: If you find absolutely nothing by drilling, do not cross-cut; if you find any encouragement whatever, cross-cut. In the workings that I visited there were stopes four feet wide of ore worth $500 per ton; where the quartz was rich, even the adjoining shale (penetrated by small stringers of quartz) was good enough to stope, for it assayed 15 to 40 grams gold.* Small bands of shale included by the vein assayed equally with the quartz. It seemed to me that, as compared with the San Rafael lode, this bonanza vein was particularly definite; there was no gouge and the shale at the walls was broken off clean, without shattering or twisting, the bedding of the outer country lying flatly right up to the ore. The vein is apparently younger than the San Rafael, because there are few signs of later movement, such as slips or gouge-seams. The ore itself is beautifully ribboned; minute crystals of pyrite encrust the quartz, especially in geodes or vugs; the richest ore is *mosceado*†—that is, speckled with argentite.

On the seventh level there is an interesting vein occurrence; this is a sulphide streak, 26 in. wide, in the foot of the San Rafael lode, which here is 22 ft. wide. The sulphide streak crosses the San Rafael and is therefore younger. The foot-wall country in this part of the mine is porphyry (andesite) and the sulphide streak is built up of brecciated porphyry, the hanging being irregular and penetrated by quartz veinlets, while the foot-wall carries a gouge, beneath which the fragmentary character of the vein-stuff is evident. This vein carries a pyrite which is coarser than that of the new West vein and in the ratio of 12%; the West vein yields one ton of concentrate to 16 tons of crude ore, that is, over six per cent.

In speaking of ore at El Oro as being worth so many dollars, it is meant that it contains so many pennyweights of gold, for the silver is not included. This is largely a habit inherited from the days when the silver was not extracted to any considerable degree. A $7 to $9 (or 7 to 9 dwt.) gold ore will carry $1.50 to $2 or 2.5 to 3.3 dwt. silver per ton. The gold is free and in fine particles, rarely visible, while the silver occurs chiefly as the sulphide (argentite), with some chloride in the upper levels. The quartz is extremely hard and flinty, beautifully ribboned in lines parallel to the walls of the lode. In this respect and in its general appearance it often reminded me of the ore produced by the Amethyst and Last Chance mines at Creede, Colorado. Argentite occurs along the lines of ribboning in minute streaks between seams of opalescent quartz; the natives call these *hilos*, or threads. The ore is largely a replacement, by silicification, of the encasing country and this holds true no less of the andesite than the shale. The Esperanza is sending mineralized porphyry to the mill and mineralized shale to the smelter. Beautiful pseudomorphs of quartz after calcite are frequent, they appear as sharp scalenohedra and resemble the 'water quartz' of Cripple Creek. The best specimens occur in the small horses (or included fragments of country) within the vein and on the outside of the big pay-streaks. All the surrounding shale shows effects of mineralizing activity and the outside andesite will often yield traces of metal; for instance, the old decomposed andesite on the fifth level of the Esperanza assayed 0.29 oz. silver and traces of gold.

At the time of my visit, at the end of October, 1905, the rate of production of El Oro district was slightly over $1,000,000 per month, distributed thus: Esperanza, $650,000; Dos Estrellas, $240,000 and El Oro, $200,000. An output of $12,000,000, 82% of it gold, made El Oro the second most productive gold-mining centre on the American continent.

* A gram of gold is worth 66.4c. and a gram of silver 1.7c. My description of the orebody is based, it must be remembered, on notes made at the end of October, 1905.

† From *mosca*, a fly.

TRANSFER OF MATERIAL BY LAUNDERS.—The Butters' cyanide-plant at Virginia City, Nev., is situated some two miles below the town, and was placed there in order to work a large tailing dump which had been acquired by the company. The plant has no facilities for crushing ore, though a stamp-mill annex is now being built, consequently, when custom ore, as for example, Tonopah ore or low-grade ore from mines in town, was sought for treatment, the question of crushing and of delivery to the plant had to be considered. There is a mill in town containing eight Kinkead stamps, and of a capacity of 60 to 70 tons daily; it is conveniently placed for receiving and crushing the above-named ores, so that the cost of delivery would be low. Here the ore is crushed to pass a 40-mesh screen, and then passed over Frue vanners to remove the concentrate, which has as high a value as $1,000 per ton, while the tailing, constituting the bulk of the ore, is put in excellent condition for cyanide treatment. The next question was how to deliver this at a distance of two miles to the plant situated several hundred feet vertically down the gulch. To do this a 12 by 12 in. launder was constructed conducting the tailing, containing twelve times its weight of water, to the plant. This it has done very effectively, the contained slime serving to stop the leakage at the numerous joints of the launders. The chief expense has been the maintenance of the line. While satisfactory in warm weather this plan has, however, failed in winter owing to freezing. In a country such as Mexico there would not be this difficulty to encounter. The alternative plan, about to be carried out, is to put in a two-mile aerial tram-line, delivering the coarse ore to the plant, and crushing it there.

THE causes which have combined to cast a single grain of sand upon the shore are infinite, and the infinite can neither be surpassed nor understood. We cannot understand what it is or how it comes to be where it lies, and yet we can make geology useful. Also, it is a maxim of science that results are obtained by approximation through error, and that the truths of one generation are the errors of the next.

Useful Definitions.

By S. F. Emmons.

MATERIALS.

Ore.—*Ore may be defined as a natural association of minerals from which one or more of the useful metals may be profitably extracted. That such profitable extraction should be possible under existing conditions is not essential. Ores that do not pay to work today may become of great economic value a year or ten years hence without any change in the character of the ore itself. In describing an ore deposit the ores may be classed as payable or nonpayable. The common term for the latter in German mining literature is the prefix *taub*, signifying sterile or barren, but 'nonpayable ore' seems to be preferable to 'barren ore.'

Gangue.—This term is properly applied only to the earthy or nonmetallic minerals that are of common occurrence in ore deposits, such as quartz, barite, chlorite, fluorite, calcite, dolomite. The practice of regarding as gangue any metallic minerals that may happen to be of no economic value is not advisable, even if they be called metallic gangue, for it permits no uniform distinction between ore and gangue.

In describing the various minerals found in an ore deposit, it is well to distinguish the gangue minerals which are exogenous, or have been brought in from some outside source, from those which are the product of alteration of the wall or country rock.

Vein material.—As a collective term to describe the aggregate of materials which make up the orebody the phrase 'vein material' or 'vein stuff' may be used. 'Vein stone' is less desirable, for the reason that 'stone' is widely used among mining men as a technical term for valuable ore, and in England 'vein stone' is synonymous with 'gangue.'

Gouge.—Gouge or selvage is a soft, clayey material sometimes found between a vein and the country rock, and usually formed by the trituration of the latter by motion subsequent to the formation of the vein. The term should not be loosely used for any soft, crushed material.

Country or *country rock.*—'Country' is the miner's term for the rock which incloses an ore deposit. The term 'country rock' has been criticised as tautological; nevertheless, it is sanctioned by very general usage, and its use is considered advisable where the single word 'country' might lead to confusion in the mind of the nontechnical reader.

FORMS.

Vein, lode, vein systems.—A vein is a single ore-bearing fissure generally, though not necessarily, with one or two well-defined walls.

When several veins are so closely spaced that the ground between them becomes in places ore-bearing and in its whole width constitutes an orebody, the assemblage is spoken of as a 'lode.'

'Vein system' may be used for a larger assemblage of vein fissures, which may include several lodes. The fractures of the earth's crust that admit of ore deposition are so multiform that it is not possible to give a stricter definition. Usage may vary somewhat in different districts, but the general order from simpler to more complicated fractures will be 'vein,' 'lode,' 'vein system.' The more subordinate fractures, such as little veins that cross the material included within vein walls, may be called 'veinlets' or 'stringers.'

Shear zone.—It is well to avoid a too general use of the term 'shear zone.' In one sense any vein could be called a 'shear zone,' since its fissure was probably formed under some sort of shearing stress. On the other hand, 'shear zone' is more properly a term belonging to general geology, used to define the zone along which the rocks have been sheeted or laminated by a shearing stress with some lateral movement, but which is by no means necessarily or even frequently mineralized. If the term is used to designate mineral-bearing fissures in general, this distinction is lost sight of. It is therefore advisable to restrict its use to deposits formed along geological shear zones where the resulting water channels were so irregular that they can not be defined under any of the preceding heads.

Sheeting or *sheeted zone* may be used in cases where the movement has resulted in parallel fissures that have left thin sheets of country rock between them.

Bedded vein.—As rock fractures are independent of and generally cut across the bedding, the alternative form of deposit, as contrasted with a vein deposit, is one that conforms with the bedding, and has hence been called a 'bedded deposit.' Among miners the term 'blanket vein' is usually applied to any nearly flat deposit.

Gash vein is a term employed by Whitney to describe a vein that fills joints or fissures in limestone in the lead deposits of the Mississippi Valley region. It is a vein that does not extend beyond a given bed or similar rock mass.

True fissure vein.—This term was originally used by Whitney to describe a true vein as distinguished from a gash vein, the latter being limited in extent, whereas the former, according to him, "may be presumed to extend for an indefinite distance downward." From this statement apparently has sprung the idea common among miners that a true fissure vein is the most desirable form of mineral deposit, because of its indefinite extension. This is a popular delusion that it is not desirable to perpetuate; hence the use of the term should be avoided. 'True vein' was the term in use before Whitney's publication, and among the earlier writers on ore deposition signified a vein deposit filling a fissure; hence the term 'fissure vein' is in a strict sense pleonastic and should not be used in classification.

The following forms of structure may be recognized in the material filling a fissure opening:

1. *Banded structure*, where the vein materials show a banding approximately parallel to the wall. This may be subdivided, according to origin, into—

a. Banded structure by filling, where the filling is evidently the result of successive deposition of vein materials on the walls of an open space. If the layers are symmetrically arranged on either side of a central band containing druses with crystals pointing inward, this is called *comb structure*.

b. Banded structure by subsequent movement, which is produced by a simple sheeting of the vein material after original deposition, and is called *ribbon structure*. Sometimes such movement results in a re-opening along the new plane of movement and the deposition of new material in the opening.

c. Banded structure by replacement, where the original fissure consisted of a number of parallel openings separated by thin bands of country rock and where, during or subsequent to the filling of these openings, the intervening bands of country rock have been more or less completely replaced by vein material.

2. *Breccia structure*, where the friction breccia or dragged-in fragments of country rock constitute a considerable portion of the vein filling, and the ore has been deposited in the spaces between the fragments, often in more or less concentric shells or layers around them. Breccia structure may occur in any vein; hence it is not

* Abstracted from 'Suggestions to Authors of Economic Papers' by S. F. Emmons. United States Geological Survey.

desirable to use 'brecciated vein' as a term of classification.

Some of the variations of the vein deposit are as follows:

Linked veins.—These are deposits filling approximately parallel and overlapping fissures, arranged en échelon, and connected or linked by small, irregular cross-stringers. As the deposit pinches out on one fissure it is taken up on one of the overlapping fissures.

Stringer lode.—A lode made up of irregularly branching and anastomosing stringers or veinlets. The rock between the veinlets is frequently so much mineralized as to constitute ore, when the whole is worked as a single vein.

Chimney, stock.—'Chimney' is applied to orebodies which have not the tabular form of a vein, but are rudely circular or elliptical in outline horizontally and have a very considerable vertical extent. 'Stock' is applied to a similar body of still greater irregularity of outline.

*Ore-shoot, pay-shoot.**—An ore-shoot is the richer portion of a deposit. A pay-shoot is that which is rich enough to exploit. While its outlines are not generally well defined, one can usually determine that it has a longer axis which forms a large angle with the horizon. The inclination of this longer axis is called the 'pitch' of the shoot, a term originally used to signify the inclination of the axis of a fold. It is not synonymous with 'dip,' though in a vein deposit the pitch necessarily partakes of the inclination of the vein or its dip. It has, however, a further inclination within the plane of that vein.

The true dimensions of such a shoot would be given by the length of its longer axis and the area of one or more cross-sections normal to such axis. Inasmuch, however, as its true form can rarely be determined, it is common practice to speak of its vertical extent, and of its length and width or thickness, as those of a horizontal section of the body on a given level of the mine. These are evidently not true dimensions unless the longer axis of the body is strictly vertical. It is advisable to follow the usage adopted by Messrs. Lindgren and Ransome in their Cripple Creek report and call the longer axis 'pitch length,' and the horizontal dimensions along the level 'stope length.'

Contact deposits.—It is advisable to restrict the term 'contact' veins or deposits, as has been suggested by Lindgren, to those which have been formed by contact-metamorphic agencies and which carry the minerals characteristic of such action. This use eliminates from this category many forms of deposit that are so termed simply because they happen to occur at the contact of two different kinds of rock without regard to their origin. Contact deposits, as thus restricted, occur mostly in limestone at or near its contact with an intrusive igneous rock. They are supposed to have been formed by gaseous or aqueous emanations from the cooling intrusive mass. They are very irregular in form and are often cut by eruptive dikes. Mineralogically they differ from other deposits by the contemporaneous formation of oxides and sulphides, principally of iron, and the association of the metallic minerals with the various lime-silicate minerals that ordinarily result from contact-metamorphic action. It must be borne in mind, however, that this mineral association may also result from regional metamorphism, but the resulting deposits differ from contact deposits in that the metamorphic processes have not introduced new or foreign material, but have simply altered or concentrated that which is already present.

Fahlband, segregated vein, impregnation.—As a general rule care should be taken to avoid using the name of a process as the definition of a type of deposit. A number of terms that are useful in descriptions can not for this or for some other reason properly be used in defining types of ore deposits. Such are 'fahlband,' 'segregated vein' or 'segregation,' and 'impregnation.'

'Fahlband' is a local Norwegian term not generally applicable nor easily defined. It was originally used by German miners to distinguish certain bands of schistose rocks which are impregnated with finely divided sulphides and not in themselves rich enough to work, but which were thought to have exerted an enriching influence on the veins that cross them.

The other two terms define processes that may take part in the formation of many different deposits, and hence can not properly be used to characterize a single type.

'Segregated vein' has been used, for instance, to define materials that have been concentrated in a given sedimentary bed. The term would be more appropriately used for the material gathered together from a molten magma. In either case, it is not sufficiently distinctive to be used to characterize any single type of deposits.

The term 'impregnation' has been used by different writers in many and conflicting senses. It properly signifies the introduction of mineral substances in a finely disseminated condition into rocks, either as a filling of open spaces or as a replacement of certain minerals. To describe the occurrence of ore in small, irregular, disconnected patches throughout the mass of a rock 'dissemination' or 'disseminated deposits' is a preferable term, since it has no genetic signification.

PROCESSES.

Metasomatism.—This may be defined as the process by which, through chemical interchange, a mineral or an aggregate of minerals undergoes partial or complete change in chemical constitution. The term 'metasomatism' is of wider application than 'pseudomorphism,' in that it does not necessarily involve the preservation of the crystalline form of the original mineral. In large rock masses, as, for instance, in the metasomatic replacement of limestone by dolomite or by metallic sulphides, it often involves a change in volume, the resulting mass being more or less cavernous.

Replacement.—As a general term synonymous with 'metasomatism,' 'replacement' is preferable to 'substitution,' since the latter is a chemical term strictly defined as "the replacing of one or more elements or radicals in a compound by other elements or compounds," a restricted usage to which 'replacement' is not confined. Replacement may be either partial or complete, according as only a part or the whole of one rock or mineral has been replaced by another.

Alteration.— The term 'alteration' applies to the partial change of substance in a rock or mineral which does not necessarily involve its replacement by another. It is a purely chemical process.

Decomposition.—This term signifies a dissolution of a rock or mineral into its component parts, which involves a physical as well as a chemical change. It occurs most commonly during the process of weathering.

Weathering.—The term 'weathering' should be confined to changes in cohesion and composition of rocks near the surface that are due to the decomposing and oxidizing action of surface waters. Its tendency is to destroy the rock as a geological unit. The German usage of *verwitterung* to cover all changes due to weathering, thermal action and other causes, is objectionable, since it is liable to lead to misconceptions.

*Sometimes wrongly written 'chute,' which is a French word signifying fall and properly applicable only to the artificial passages through which ore falls to a lower level.

Developing a Prospect.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR LAKES.

One of the mistakes in mining that has ruined many promising young properties, is the attempt to prove and develop a vein high up on a mountain, by a long and costly cross-cut driven from the cañon far below. Hundreds of abortive 'tunnels' of this kind may be seen lying idle in our steep mining regions, the majority having never reached half way to their intended goal. A few have gone beyond, and missed the vein. Most of them are failures. The explanation may be as follows:

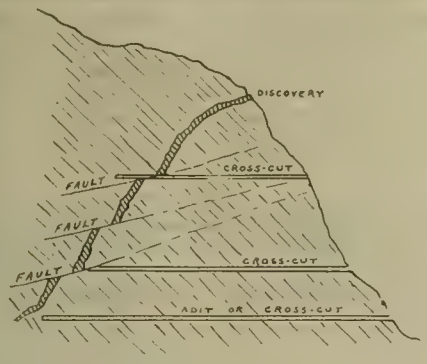


Fig. 1.

No. 1. The distant stockholders of the company grew tired of hearing nothing about ore or of the development of their claim except the costly slow progress of an indefinitely long adit, and therefore failed to send more money.

No. 2. The ground proved harder as the adit was advanced, more costly to work, and longer than originally estimated.

No. 3. The vein sought for was mistaken for another which proved barren.

No. 4. The real vein was passed without being recognized, and the adit was carried into the country rock until a halt was called.

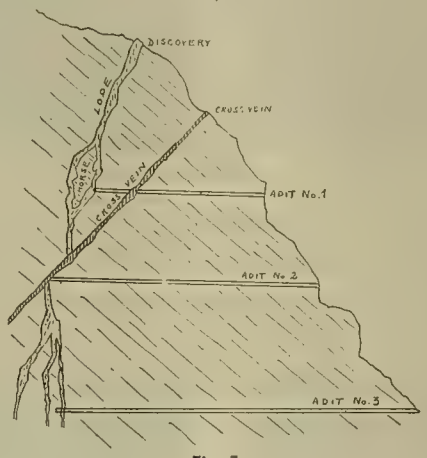


Fig. 3.

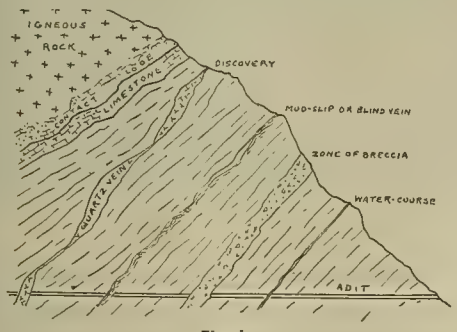


Fig. 4.

No. 5. In the progress of the work the miners wandered here and there, tempted by this and that sign of ore until the adit lost its direction, or the direction may have been altered by contractors who were seeking soft rock and shunning the hard.

No. 6. The company found, as the work progressed, that it was being assessed for things not originally contemplated, such as air-compressors, machine-drills, etc., to continue the work and maintain ventilation.

Of these various difficulties and disasters in long cross-cuts one of the commonest is the failure to meet the vein in its entirety or to recognize it or its representative when actually cut at the point where, on the assumption of a uniform dip from the surface, it might reasonably be expected. The vein when struck may appear at the point of section, so small, insignificant, and barren, that it is assumed not to be the same as the large promising vein on the surface. Or instead of a vein, only a barren narrow crevice, a watercourse, a mud slip, or a zone of crushed rock, may appear as its representative and the adit is advanced into the country, groping blindly for the expected ore.

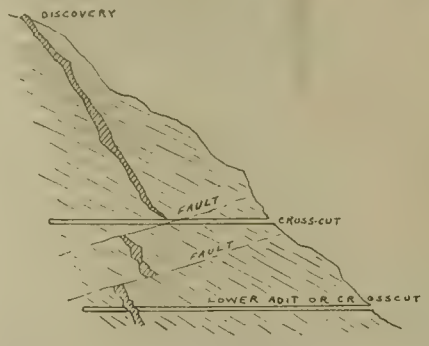


Fig. 2.

Suppose that the angle or degree of dip should change with depth, either by steepening or lessening, or by a series of steeps and flats, or be materially deflected by faulting, then a calculated point where the vein should be cut may be considerably off, especially at so great a depth as between 500 and 1,000 ft. Under any hypothesis, the distance to the vein is almost sure to be greater than estimated or even surveyed, and if there was no accurate survey the distance to the vein will certainly be exaggerated, for the slope of a mountain to the unaided eye is exceedingly deceptive in calculating underground distances. While the prevailing mistake is to aim at getting too great depth, we have known adits being run a thousand feet to get a depth of less than one hundred.

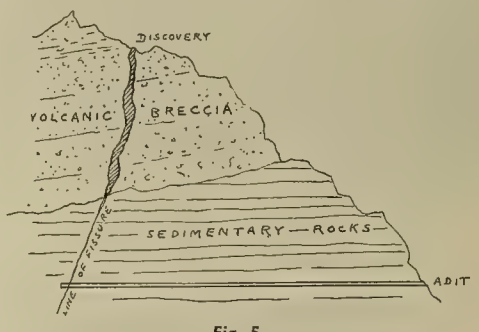


Fig. 5.

The vicissitudes of a vein, such as change of dip, faulting, pinching, widening, splitting by 'horses,' long intervals between ore-shoots, and the like, are familiar to

any miner who has worked in our deep mines, and he knows the 'hit or miss' possibilities which such involve in the case of a long cross-cut 'tunnel' to the vein.

In the steep cliffs on either side of the profound cañons of the San Juan region in Colorado, there are excellent opportunities of observing the downward course of great fissure veins for a thousand feet or more, and such object lessons might well intimidate the projector of long deep cross-cuts. These great veins as they descend the precipice are seen to be split by 'horses;' to wander or branch off into the country rock; locally, or for long stretches they pinch almost to nothing, and widen again; their downward dip and course may be irregular, sinuous, or materially broken and deflected by faults, by cross-courses or by other veins.

In veins in schistose or thin-bedded strata nearly conforming to the sinuosities of the bedding planes, veins occur in lenses along ill-defined lines and at irregular distances, separated from one another by barren ground or connected by slight uncertain traces of vein-matter or by no trace at all other than the slickensided walls of a narrow crevice. It is obvious how perilous would be the task of striking the particular vein desired when the country abounds with veins and mud-slips, by a long 'tunnel' driven at great depth below the upper workings.

In some districts veins showing well and producing heavily near the surface are notorious for giving out in their orebodies at moderate depth. Long adits to tap at great depth such uncertain veins have, for the most part, failed.

Apart from variability in direction and inconstancy of ore-shoots in fissure veins, there is a risk from change of rock formation. Thus, in the San Juan region, the productive fissure veins for the most part occur in, and are confined to, a very thick mass of volcanic breccia resting on up-tilted sedimentary beds (Fig. 4). On leaving the breccia and entering the sedimentaries the fissure may cease abruptly, or if continuous, be exceedingly poor or totally barren. A cross-cut driven below into the sedimentaries would fail in its object and a raise would have to be run a long way into the breccia to find a productive portion of the vein.

Omitting the extremes, such as developing an unproved hilltop prospect by a long adit a thousand feet or more below it, let us take the common and more moderate one of development by a 'tunnel' 1,000 ft. long with a projected upraise 500 to 600 ft. on the vein. This scheme, in my opinion, is 500 ft. too long and the upraise 300 ft. too high.

One of the principal difficulties of such an undertaking is that of air and ventilation. Naturally air from the entrance, augmented by a furnace and pipe, and later by a fan, may answer for a while, but when great length is attained and when it comes to rising on the vein this will not suffice. The difficulty may be overcome partly, by using an air-compressor and machine-drills.

Suppose the vein to be struck eventually and a raise begun. In such work a hoist, either by steam or air, becomes a necessity, and it is soon found imperative to get an outlet to the surface either by driving along the vein or by a cross-cut. If such short cross-cuts from the vein become necessary, would it not have been better from the first to have attacked and proved the vein by a series of short 'tunnels' driven from the surface at moderate intervals successively down the hillside than to have recourse to the expense of the long adit, with all its cost, risk, and difficulties? One of the advantages of the short cross-cut at shallow depth is that in case of missing or failing to cut the vein, raises can easily be made to the vein where it is in place. In the long deep adit such experiments are too costly.

In a young property the aim is not to plan the future development of a great mine, but to prove and show what you have, whether the vein and ore go down, whether or not the property is prospectively valuable, and is worth working. The mistake of the long adit is that it plans for the future development of a mine on a grand scale before it is actually known with any degree of certainty what there is in the prospect or whether it has any chance of becoming a mine at all. Obviously, the best way to proceed with a young property is to begin above and work gradually downward, whether by shaft or short cross-cuts at intervals, or by both shaft and tunnel. This plan keeps the operator close to the vein and brings to the minimum the risks of losing the vein.

No hard or fast rules will fit all the circumstances and positions of prospects in the field. What might fit in one case would not do in another. What might be excusable in one case would be folly in another. Long adits may serve their purpose in the maturity of the mine when compelled for drainage purposes.

The accompanying illustrations show conditions sometimes encountered by cross-cuts to the vein.

Fig. 1 shows a fissure vein dipping into the mountain away from the slope and contour of the hillside. At first the dip is deceptively gentle, but it soon steepens. With depth, faults are encountered; these deflect the vein and cause the adit to be longer than anticipated.

Fig. 2 shows a vein conforming more to the slope, but in depth deflected inward by a fault. A cross-cut misses the vein by striking the line of fault.

Fig. 3 shows a big fissure vein like those in parts of the San Juan. A large 'horse' occurs part way down, and the thickness of the vein is reduced to a minimum. Lower down its course is deflected by a cross-vein, and below that the vein splits up into three branches, which may eventually come together.

Fig. 4 shows the risks of a cross-cut in lenticular veins. The cross-cut aims at reaching the contact with the igneous rock, but though there is sometimes a vein or ore deposit at such a contact, there are intervals of barren ground or 'tight' contact.

Fig. 5 shows fissure veins in one formation, as in the volcanic breccia of the San Juan region, becoming barren in an underlying sedimentary zone.

THE SUEZ CANAL is being deepened to give 31 ft. of water so as to allow of taking vessels of greater draft; at present the depth prevents any material increase in the size of steamers of the various lines between British and Oriental ports, while some large battleships have to transfer their guns to lighters and go through with coal-bunkers almost empty. In 1902, the permissible draft was increased from 25 ft. 7 in. to 26 ft. 3 in. In connection with the deepening, the curves are being improved and widened, and at certain points the bottom width is being increased from 102 ft. to 128 ft., while in the Bitter lakes the channel is being widened to allow ships to pass. The average width at the water surface is from 300 to 360 ft. in the northern part and from 240 to 300 ft. in the southern part. It is suggested that the entire canal should be widened to a bottom width of 150 ft., so as to enable ships to travel continuously in opposite directions instead of having to wait at passing places. One reason for this is said to be the promotion of a scheme for a rival canal. —*Engineering News.*

THE grandest, apparently most solid, eternal mountains, seeming so firm, so immutable, are yet ever changing and crumbling into dust. The shattered ridges are evidence of their sufferings. Every ridge of the Alps and every summit is surmounted by a piled-up heap of fragments.

In the Andes.

We are indebted to Mr. W. H. Shockley, now at Tonopah, Nevada, for the accompanying photographs and notes on an interesting mining region. They were obtained in the course of a journey to the Montebello mine in Carabaya, Peru, in Lat. 15° south and Long. 70° west. This portion of Peru was long renowned for its rich gold mines and in the days of Pizarro a mass of gold the size of a horse's head is said to have been sent to Spain. The trails to the mines cross the Andes at a tremendous height above sea-level; in this case the crossing was at Aricoma pass, at 17,000 ft. The character of the



Fig. 1. Glacier on the Aricoma Pass, 17,000-ft. Altitude.



Fig. 2. Summit of the Aricoma Pass.

climate is suggested by the glacier shown in Fig. 1; it being remembered that this body of ice is within the tropics. A large cairn surmounted by a horse's skeleton marks the summit of the pass, as shown in Fig. 2. In this province of Peru, near a place named Poto, is a mine



Fig. 3. Rope Bridge on the Santo Domingo Trail.

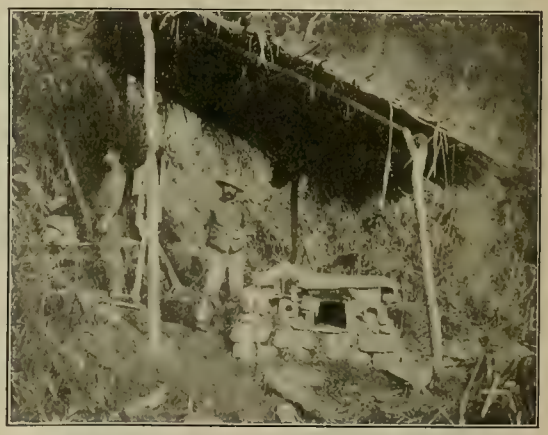


Fig. 4. Blacksmith Forge at Montebello Mine.

that is probably the highest in the world, for it is close to a glacier at about 18,000 ft. We remember being told at the Sunrise mine, near Skipper's Point, in Otago, that that was "the highest in the world," though it was actually only 7,200 ft., or lower than any mine of importance in Colorado. But in Colorado they think they hold the record in this respect, the fact being that the highest mine is the Present Help, on Mt. Lincoln, at a few feet above 14,000. Our readers may be able to contribute other data on this question.

The trail that Mr. Shockley followed descends in 50 miles to 3,000 ft., on the Inambari river, which is crossed many times on suspension bridges, made of rope as shown in Fig. 3. Two horses are in the act of crossing, one ridden and the other led; on the trail the remainder of the expedition is proceeding in single file. In the distance, up the valley, the clouds obscure the high peaks. These mists rise from the eastern side of the Andes and rise to the summit, where they encounter the warmer air of the Pacific slope and become dissipated. The trail connecting the Santo Domingo mine with the low country is only a narrow shelf blasted out of the solid rock, overhanging the river. In going to the Montebello mine, the trail at the highest point is 600 ft. above the ravine and for miles a stone dropped from the hand of a rider will fall 200 ft. vertically into the stream. The Montebello mines are at about 5,000 ft. altitude in the verdant montaña, or lower mountain land. They were worked many years ago, but the forge shown in Fig. 4 is about all that remains of the old buildings. Many 'tunnels' now tenanted by the vampire bats are the only record of the work done long ago, but as modern energy spreads into these remote parts of Spanish America, they are destined to be explored and exploited.

It is worthy of remark that not only do fragments of such rock as limestone often present the characteristic forms of the cliffs from which they have broken, but that pieces of mica schist will represent, in a wonderful manner, the identical shape of the peaks of which they had formed a part.

Submarine Coal-Mining.

It is an interesting fact that there are now in Cape Breton six collieries working under water. The largest is the Princess or Sydney pit on Cape Breton Island. This colliery was the first in North America to mine coal from beneath the bed of the Atlantic ocean. The seam of coal averages between 5½ and 6 ft. thick, of best quality. The angle of dip or inclination seaward is 5°. The working of the whole coal under the sea by the bore-and-pillar system was commenced in 1877, under an overhead cover at the shore line of 690 ft. of solid measures, although part of the workings driven to the rise under Sydney harbor, was operated under a cover of 500 ft. or less. The present workings are distant from the shore line 5,800 ft. on the dip. At this point the overhead cover is 1,140 ft. thick, with 33 to 40 ft. depth of water above it. The under-sea workings in the whole coal cover 1,620 acres. No sea water has yet found its way into the workings as the result of removing the pillars. A feeder of a few gallons of water per minute was encountered in some whole-coal workings driven to the rise, as also at the face of the water-levels driven in the direction of the outcrop to the south, but this water evidently followed the seam of coal downward from its outcrop under the water of the harbor. There has been no water known to come from overhead across the measures. This immunity from overhead leaks from the ocean is probably due to the presence in the superincumbent strata of beds of fire-clay or under-clay of a total thickness of 39 ft., as well as to the numerous beds of shale. The subsidence of the overhead strata caused by the removal of a bed of coal 6 ft. in thickness, would probably, under these conditions, soon choke itself, so that there would be no further actual motion or settling of the strata for more than, say, 100 ft. upward. Above that point the elasticity of the beds of shale and fire-clay mentioned would prevent any rupture. Fire-clay when brought into contact with water soon forms soft, plastic clay impervious to water. Out of the submarine area there has already been taken some 5,250,000 tons of coal from the main seam, while the company has also commenced the working of another and thicker seam in the same area, from which in all likelihood they will secure as much as has already been taken.

ELECTRIC SMELTING.—At a recent meeting of the Faraday Society, at London, Dr. Eugene Haanel presented a report on experiments made at Sault Ste. Marie on the smelting of Canadian iron ores by the electro-thermic process.

The furnace, which is fully described and illustrated, was of the Heroult type; it absorbed 5,000 amperes at 35 to 40 volts (power factor 0.919), being fed from a transformer of 225 kw. capacity. The official experiments, of which a selected number are explained in detail with full chemical, electrical and thermal data, lasted nearly two months, and during that time 150 casts were made, yielding 55 tons of pig iron. The experiments indicated that under normal conditions about 11.5 tons were produced by an expenditure of 1,000 e.h.p.-days; with an improved furnace of, say, 1,500 e.h.p. capacity, a figure of 12 tons should, it is stated, be reached. The mean figure provisionally adopted by the Commission was only 7.8 tons per 1,000 e.h.p.-days. The consumption of electrode was about 18 lb. per ton of pig iron; it was greater for white than for gray iron.

The results obtained are summarized as follows:

1. Magnetite (which is the chief Canadian ore) can be as economically smelted by the electro-thermal process as hematite.

2. Ores of high sulphur content not containing manganese can be made into pig iron containing only a few thousandths of one per cent of sulphur.

3. The silicon content can be varied as required for the class of pig to be produced.

4. Charcoal, which can be cheaply produced from mill refuse or wood that could not otherwise be utilized, can be substituted for coke as a reducing agent, without being briquetted with the ore.

5. A ferro-nickel pig can be produced practically free from sulphur and of fine quality from roasted nickeliferous pyrrhotite.

6. The experiment made with a titaniferous iron ore containing 17.82% titanic acid permits the conclusion that titaniferous iron ores up to perhaps 5% titanic acid can be successfully treated by the electric process.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The red mineral from Spokane, Wash., marked M. H. H. is mostly earthy clay stained with iron oxide and including scales of mica.

The sample from Bodfish, Kern Co., Cal., is Magnetite—magnetic iron oxide—with a little earthy iron oxide and a small amount of argillaceous mineral.

The white rock from Glenns Ferry, Idaho, marked H. W. B. is Rhyolite-tuff, a firmly compacted volcanic ash, including many rounded grains of quartz.

The rock from Eldora, Colo., marked J. K. D. is Granite with scales of specular iron ore. The black piece is principally specular iron, which is a variety of hematite (iron oxide).

The rock from Mazama, Wash., is Quartz-porphyry, but is much altered and contains abundant calcium-carbonate, some of which has crystallized on the fracture planes of the rock.

The rocks from Sacramento, Cal., marked C. M. B. are from a basic dike, but its original character is completely obscured by alteration, the rock being serpentinized. It was probably originally gabbro.

The rocks No. 1 and 2 from Terrazas, Mex., marked D. G. are brecciated felsite, and contain a little iron ore, particularly No. 2. No. 3 is Feldspar-porphyry and also contains ore. No. 2 and 3 should be tested for precious metals.

The minerals from Denver marked W. J. M. are: No. 1, Zinc-blende tarnished blue by copper salts; No. 2, Marcasite (iron sulphide); No. 3, Zinc-blende, pyrrhotite and chalcopyrite; No. 4, Quartz-mica-diorite-porphyrite; No. 5, Garnet.

The rocks from Naco, A. T., are: That marked A, Quartz, evidently the result of replacement of silica for the constituents of some intrusive rock—possibly rhyolite. It has now the appearance of being an ore. B is similar, though containing more iron.

The rocks from Penticton, B. C., marked A. J. D. are: No. 1, Feldspar with a few scattering bunches of fibrous hornblende; No. 2, a very silicious fine-grained greenstone; No. 3 is similar to No. 2, but somewhat darker, due to greater amount of hornblende present; No. 4 is coarse Biotite-granite.

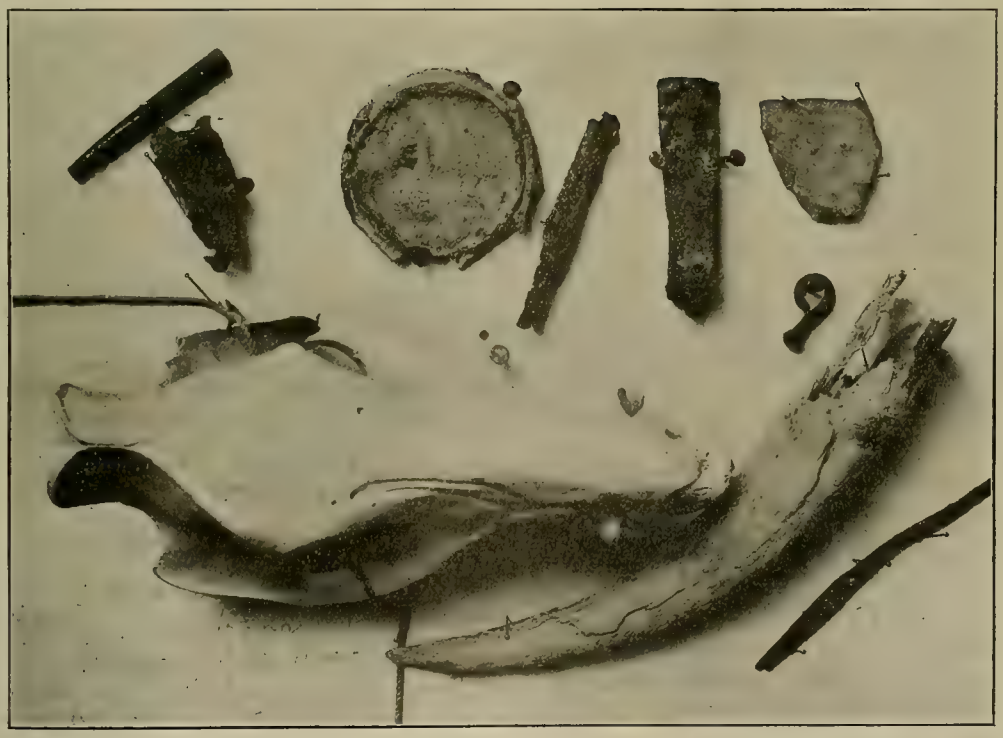
La Mina Marques Manzanal.

This old Spanish mine, which has recently been re-discovered and opened, lies about 40 kilometres (25 miles) south of Cananea in Sonora, Mexico; it is in the Manzanal mountains, a group of hills taking its name from the mine. The mine was relocated on December 24, 1905, by Gaston Schwab of Cananea and is being cleaned out and explored. The ore is rich, and at a vertical depth of 160 ft. the vein is nine feet wide. Mr. Schwab has just purchased a good hoisting plant, sufficient to sink to 500 ft. There has been no stoping done but 400 sacks of high-grade ore assaying from 300 to 2,000 oz. silver and about 1 oz. gold and 30 to 50% lead per ton, besides a large amount of low-grade ore, has been extracted. The property is to be developed by an adit on the vein which will cut the shaft at a depth of about 300 ft. The old workings are remarkable from the fact that instead of the usual Mexican shaft (with notched log ladders) inclines were driven, one under the other (zigzag) at a convenient grade for walking up and down and carrying out the ore and waste in baskets on the backs of the miners, who were Indian slaves or prisoners. A number of old mining tools of iron and copper and the remains of an old copper lamp were found at a depth of 120 ft. in the old workings, the copper of the lamp being in pieces and almost eaten away by corrosion; the iron drills and chisels are reduced to about one-quarter of an inch in diameter, the supposition being that they were originally about one inch in diameter. There was also another remarkable find, namely, the skull of a *jabali* or Mexican wild boar, on which was carved the following inscription: *Mina Marques Manzanal MDCCCXII* (1812), and on the side a sketch of a chalice or communion cup used in the Catholic churches. The mines seem to have been hurriedly abandoned about this time, 1812, as the skeletons of two men, supposed to be Indian miners, were found in the first of the old workings opened at about 100 ft. from the surface. It is supposed they were killed while at work and left there by hostile Indians who no doubt caused the closing of the mines. The old workings have not been opened to any extent on account of being badly caved and full of debris.



La Mina Marques Manzanal.

INSTEAD of the surface of the earth being that stable, fixed thing that it is popularly believed to be, being, in common parlance, the very emblem of fixity itself, it is incessantly moving, and is, in fact, as unstable as the surface of the sea, except that its undulations are infinitely slow and very high and deep.



Old Copper and Iron Relics Found in the Manzanal Mine. The Horn is Supposed to Have Been Used for Carrying Powder for Blasting.

The Geologic Day.

By Alfred C. Lane.

*It has been vigorously impressed upon us recently that 5:13 A. M. of April 18, San Francisco time, is not the same as Washington time, but about three hours later. Therefore the day ends and begins later at San Francisco than at Washington. The sidereal day is a little different from the solar day, the astronomical year from the civil year.

There is no reason to be surprised, therefore, if we find this to be true in dividing our geological time. We measure it generally by some slow change: the evolution of life, or orogenic movements, or the accumulation of salt in the sea, the changes in sedimentation consequent on elevation of continents, or changes in climate, like the passing away of the glacial epoch.

The post-glacial time for an illustration. It is clear that the ice must have retired from the valley of the Ohio before it retired from the Straits of Mackinac some time, and perhaps a very long time. Therefore the post-glacial epoch begins later at Mackinac than at Cincinnati. Yet I do not think it necessarily should have a different name, any more than April 18 has a different name for Europe and America. Of course there are difficulties, just as there are difficulties in saying what is the birthday of a child born near midnight, or near the date-line in the Pacific. But they are inherent in the facts, and are not lessened by introducing new terms, which indeed may lead one to overlook the realities of the case.

Difficulties have arisen from the fact that the lithological evidences of contemporaneity do not always agree with that furnished by fossils, and the early assumption (really a relic of the old cataclysmic theory, according to which God made one set of created beings, then wiped off his slate and began over again) was that fossils were the best and surest index of contemporaneity, in comparison with which all other factors or means of determination were of no weight.

No competent paleontologist now holds this extreme view, and many of them, like Williams, have shown clearly that fossils are not absolutely inerrant evidence of contemporaneity. Yet the influence of the old views, and the idea that the lines of a division of geological time must be lines separating different faunas, has so persisted that the tendency has naturally been, where the faunas proved misleading, to give up the idea of time entirely, and refer merely to homotaxis.

This will be a mistake. The idea of time is present in our geological divisions and their names, and though our divisions be imperfect expressions of our ideal, for that reason to throw away the ideal would be to make the same mistake as Hobbes, to whom a straight line was merely the straightest line he could draw, and who accordingly thought he had squared the circle, because he found a construction which was correct, so far as he could see.

It does not follow, however, that we should give a new name every time we find evidence of real difference in geologic time in the beginning of one of our geologic divisions. It should be carefully noted, and left to be weighed and compared with other evidences, until we are ultimately able to place each division at each place accurately on a true scale of time, which shall be to the common scale as is astronomer's time to the local times and seasons of everyday use.

Of these various evidences, fossils are by no means the best evidence of strict contemporaneity. Other evidences, as good or better, are:

1. A shower of volcanic ash like that which has recently come from Vesuvius, *if* it can be identified, is the best evidence of contemporaneity. The same remark applies to a surface lava-flow. Individual lava-flows of peculiar character, like the foot of the Kearsarge lode, have been traced many miles in the Keweenawan, and great floods out West may, I presume, be equally contemporaneous. In time to come, geologists of the future may use volcanic ash-beds, among the series of shales and muds, which are overlooked now, as horizon-markers of the first importance.

2. The whole nexus of mud-flows, lavas, ash-beds, and the like, which make up an eruptive epoch, would not make so exact an index of contemporaneity, but in many cases are of considerable value. Keweenawan, and Triassic of the Atlantic coasts are illustrations both of the value and of the danger of such correlations. While indicating real contemporaneity, if the correlation is correctly made, there is likely to be an eruption of undistinguishable rocks at widely different times.

3. A change of climate may extend with great rapidity over a province or over a very large part of the world. The glacial period in Europe and America is one glaring illustration. Another is the change in the Carboniferou from the hot dry climate of the Mississippi to that of the Pennsylvanian. The change may, of course, have occupied considerable time in its spread, but probably only a fraction of the duration of each period. Salt beds, whether formed in desert wastes or inlets of the ocean, point to a dry climate.

4. If one could only get samples of water in which the strata were buried which had not changed in the meantime, one might, in the case of open marine strata, be able to date them from the progressive change in the character of the sea water. This may be of more value in the future than in the past, as it probably can be used only on water carefully preserved from deep borings in slightly disturbed synclinals where numerous beds are impervious.

5. Changes in the elevation of the land, and consequently in the shore-line, produce changes in the sedimentation in which climate may co-operate. These changes in the sediment-determining factors may be slow, like the tilting of the basin of the Great Lakes, now going on. But even in such cases they may be nearly simultaneous over long stretches of shore-line. They may also be sudden, like the uplifts of the South American coast described by Darwin. In general, it may be said to be likely that a sudden change, involving the injection of fine mud in the ocean water, is not likely to be extremely local.

The great advantage that fossils have is that they never come back to their original combinations. The course of life has never really gone backward, whereas sandstones, limestones, and shales of recent times may be undistinguishable from those of earlier times. Thus, when it comes to determining the general place in the geological column, to deciding whether the Lake Superior sandstone was 'New Red,' 'Old Red,' or coeval with the Cambrian fossils, if obtainable in sufficient quantity, far outclass other kinds of evidence.

If objection is made to using paleontology for the larger and broader time-determinations, and using various other methods for details, and not always drawing the line at the same place in using terms applied to these divisions in the different regions, we can again fall back on the analogy with the divisions of common time, where the sun rules the year and the moon long ruled the month, while the finer and more exact divisions depend on other data, and the year does not begin or end exactly at the same time at every place.

* Abstracted from *The Journal of Geology.*

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Editorial.

THE letter from Mr. E. A. H. Tays on conditions in Mexico states the facts plainly. It will prove satisfactory to those who want to see quiet maintained in Mexico, and to that increasing number of energetic men to whom our southern neighbor affords a profitable field of industry.

THE position of amalgamating plates in the stamp-mill is one which is open to discussion; the usual practice of attaching them to the front of the mortar causes vibrations, the usefulness of which is questionable. Mr. Percy Morgan discusses the matter in this issue.

MR. LEWIS T. WRIGHT gives us, in this issue, his final paper on 'Pyrite Smelting Without Coke.' He finds that, when using cold blast, rather less than one-third of the calorific power of the sulphur volatilized in smelting is effective, while with warm blast it was possible to diminish the percentage of coke in accordance with the heat developed by the increasing quantity of sulphur burned off, and finally with as much as 25 per cent of sulphur in the charge it should be possible to run without any carbonaceous fuel. In conclusion, he presents a table giving the heat requirements of a blast-furnace working without coke and shows that of the total heat developed the escaping gases carry off 39 per cent while the slag requires 25 per cent, the remainder being lost by radiation and by various minor causes. Another point brought out is that nearly 350 cubic feet of air is needed per pound of charge, which brings down the temperature quite close to the point of solidification of the molten materials of the furnace, approaching that temperature so closely that a hot, or at least a warm blast, is needed to bring the furnace above the critical temperature. This contribution from the pen of so well known a metallurgist is a distinct addition to our heretofore meagre information on these matters, and combines at once a profound scientific study of the subject with the results of prolonged practice in the treatment of low-grade sulphide ore, a practice worked up by Mr. Wright until he has eliminated the roasted ore heretofore considered a necessary constituent in blast-furnace operations.

WHEN one hears of so many new and large copper mines being opened up, it seems a wonder that the market is not glutted with the metal. As a matter of fact old mines are becoming exhausted as new ones are developed and accidents at one compensate for rich strikes in another. There is less said about the funerals than the births, for mines usually end their lives in a quiet unobtrusive way, however loudly their sponsors may sound the horn when they begin their career. Thus, in the Lake Superior copper district, where mining is conducted as successfully and on as sound a business basis as anywhere in the world, there have been several hindrances

to an increased production, although these are not heralded as freely as the good news from the great mines. In the first place, there have been labor strikes at the Quincy, Michigan, and Adventure mines, all of which have interfered with regular production. At the Tamarack a fire in No. 2 shaft has curtailed the output ever since January and the copper yielded by that mine for the larger part of the year is only three-fifths what was estimated. At the Atlantic the settling of the ground, due to an enormous extent of stopes, has finally caused a subsidence so general as to destroy the usefulness of the shaft and compel the abandonment of the workings, started thirty years ago. Another lode, known to exist on the property, is to be prospected, but this will not become a source of metallic wealth for an indeterminate period. These mishaps—strike, fire, and caving—are all among the ordinary chances of mining. The result is that the gain in production expected during 1906 from the Lake Superior mines will be cut in two. Even then the total yield will represent nearly one-sixth of the copper produced in the world.

Reformed Spelling.

On another page we publish a sensible and scholarly criticism of the reformed spelling by Mr. Benjamin Ide Wheeler, president of the University of California. The attempt to introduce new methods has provoked ridicule and even anger; it is now meeting with thoughtful opposition. Of course, a technical journal cannot assume any authority in such matters, for it is our duty to give information on scientific and industrial matters in whatever language is easiest understood by our readers; we accept what is considered the best usage and simply say what there is to be said with as little fuss about it as possible. To a certain degree the technical man stands between the hierarchy of science, which uses language the intelligibility of which is not required to extend among the unlettered, and those occupied in industrial pursuits, to whom language is simply a convenient tool, to be used, abused, or vulgarized, at will. Therefore, we only ask that the forms employed shall be understood among all those who speak the English language; for the engineer, metallurgist, or geologist is a man who makes the entire globe his field of action and he wants a vehicle of writing of the largest utility. He objects to peculiarities that may obstruct the exchange of ideas in America, Canada, England, Australia, Africa, India—in fact, wherever Anglo-Celtic energy is searching for metallic wealth and developing the waste places of the earth. The engineer is a citizen of the world and he wants no provincialism to hamper him. It is all very fine to say that Shakespeare spelt his name in 26 different ways, and that standardized spelling is a comparatively modern institution. We are glad to have emerged from such an orthographic chaos. Why revive it? Of course the 300 forms first launched by the Spelling Board are only the forerunners of other more numerous innovations, until the whole language has been modified to suit phonetic requirements. At the best we shall have twenty or thirty years of confusion, for only the next generation will use the new spelling consistently; and if they do, in America, it is quite certain that other people speaking the English language will refuse to do so—partly from prejudice—, with the result that we shall return to the confusion from which we have only lately emerged. The early translations of the Bible are printed with spellings so diverse as to suggest different dialects, indicative of the locality where the translator lived. It is this provincialism of speech that printing has slowly overcome, until people who read and write have reached a uniformity sufficient to render them intelligible to each other, even though they retain differences of accent and pronunciation in their spoken language. The Englishman who pronounces 'here' like *hee-awe* and the Irishman who gives it the sound of *hearre* unite in signifying the same thing when they write *here*. Phonetic spelling will not induce uniformity of pronunciation because the signs used, namely, the letters of the alphabet, do not possess a constant value and for the most part people are not as conscious of their own peculiarities of pronunciation as are those who listen to them. Hence the attempt to secure phonetic spelling is destined only to make confusion, destroying the safe ground of existing conventions and substituting forms that are inconsistent among themselves and contradictory to their origin. We shall have an uneasy compromise between custom and phonetics. Neither Professor Skeat nor Dr. Murray, neither the wealth of a steel magnate nor the approval of a high executive, will succeed in dictating usage. Thank Heaven, matters of such world-wide importance cannot be settled except by world-wide agreement and when the Public Printer sets the example, we can afford to be patient. "It is to laugh." Who ever reads what he prints? It is true we mining engineers read a great deal of valuable matter emanating from the Geological Survey, at Washington, but this is all edited by cultured men in whom we repose confidence that they will not give way to a vulgar temptation. As for the rest, the political and industrial documents of the Public Printer reach the average citizen only through the medium of his newspaper, the editor of which edits it to conform with an established style. In this connection we note that one of the first to fall in with the President's order—or suggestion—was a New York attorney, who, in sending specifications to the Patent Office, adopted the 'reformed spelling.' There is exquisite humor in the notion of the Patent Office setting any sort of example, it being notorious that for curious spelling, bad grammar, and confused language, the records of the Patent Office are distinguished by a lonely splendor. Spelling must abide by the arbitrament of usage, and the printed matter most used is that of the newspaper. It is a fact, unfortunate in some cases, that among grown men ten newspapers are read for each book, and in many cases business men read the papers only. When the London *Times*, the New York *Evening Post*, the Melbourne *Argus*, the Montreal *Star*, and other representative newspapers adopt the new spelling, then the MINING AND SCIENTIFIC PRESS will accept the inevitable. Until then we are content to see changes come slowly, without fuss and without confusion.

By the Way.

In a recent address at the Commencement of Stanford University, Mr. Benjamin Ide Wheeler, president of the University of California, said:

The definition of language as voice expressive of thought is doubly inadequate. In the first place, it is far less a means of expression than a vehicle of communication. Historically it takes its form almost entirely, not from the prompting to express what is within one, but from the suggestions of hearing as to what will be intelligible to others. It is a means of communication; it always takes into account the other man; it is pre-eminently a social instrument. In the second place, it is, in modern civilized society, addressed more to the eye than to the ear. Most of us read every day more language than we hear, even if we limit our reading to newspapers and text-books, but if we turn to the higher intellectual life, there can be no doubt that our acquaintance with the larger range of powers and possibilities in language is determined immeasurably more by reading than by hearing.

The modern State is national by virtue, not of unity of blood or faith, but pre-eminently by virtue of unity in the medium of intercourse, primarily by writing, secondarily by speech. Germany has one recognized standard language overlying various shrinking dialects of speech; likewise France, Italy, Holland, Spain. Norway is held aloof from Sweden by a distinct standard of Scandinavian speech, and is turned toward Denmark. Austria-Hungary fails of nationality from lack of a common idiom.

I come now to speak of the English language. This has made more than a nation and more than an empire. The one instance in history of a single language serving two great empires; it has dedicated a broad region belting the globe to free intercourse and equality before the law. Historically it is a dialect of the English Midlands elevated by natural processes to supremacy above its colleagues and gradually extended with the spread of the English empire throughout the world, being enriched and cosmopolitanized, lifted out of its provincialism, and fitted for its broader tasks by materials absorbed from multifold sources, and being simplified in its structure and mechanism by submitting to use in the mouths of men of various minds and various tongues.

The many inconsistencies that are frozen into the mass of English orthography are undoubtedly a barrier to the acquisition of the language now extending itself as a common vehicle of intercourse beyond its natural habitat. In the inevitable discussion of its reform, however, a sober consideration of all that is involved must warn against the rash imperiling through shallow judgment of the greater good for the lesser benefit. Here follow certain points of view:

First—Uniformity in the written language throughout its entire territory in any given period, as the present, is a prime demand of civilized intercourse.

Second—The establishment for the United States of a standard of written English different from that recognized elsewhere in the English-speaking territory is an isolating and divisive movement promising loss and waste to intercourse and culture, and introducing consciousness of contrariety where the opposite is desired. The needless irritation caused by the minor differences already existing points ominously to what would result from greater.

Third—The English language is not the property of the people of the United States, still less its Government; it is a precious possession of the English-speaking world, and the moral authority to interfere with its regulation must arise out of the entire body and not from a segment thereof.

Fourth—Every person who is born to the use of the language inherits thereby a definite advantage in the world for intellectual gain, for influence and effectiveness, yes, even for commercial success, by very reason of its extension of use in uniformity of standard. This inherited advantage constitutes a vested interest and must not be trifled with.

Fifth—Any radical change, such as for instance would be involved in phonetic writing, would have the effect of cutting us off from the language of Shakespeare and the English Bible, making of this a semi-foreign idiom, to be acquired by special study. Indeed, our entire present library collections of English books would be placed beyond the reach of the ordinary reader, and be as Dutch to his eyes. The bond uniting all the product of the language from the Elizabethan period to the present day creates a very precious heritage for every speaker of the English tongue.

Sixth—The adoption of a phonetic writing, it should furthermore be remembered, would involve initiation of the various dialectal forms of the spoken language—all of which is highly interesting to phonologists, but to the plain reader anathema.

Seventh—Print is addressed to the eye, and the reader's eye, taking in whole words or even the composite form of whole phrases in rapid glance is disturbed and hindered by abnormal forms of spelling.

Eighth—The proposal gradually to introduce through the co-operation of volunteers a certain number of new spellings, and then, when these are well under way, presumably certain others, seems to promise an era of ghastly confusion in printing offices and in private orthography and heterography, as well as much irritation to readers' eyes and spirits.

Ninth—The list of three hundred words proposed by the Simplified Spelling Board is a somewhat haphazard collection following no very clear principle of selection. One hundred and fifty-seven of them, such as *color* for *colour*, are already in their docked form familiar to American usage. The remainder seem to owe their inclusion in the list to their having been misspelled a number of times in English literature; thus, the *y* is tabooed in *pigmy* (for *pygmy*) not in *synonym;* the older spelling is resumed in *rime* (for *rhyme*), but not in *gest* for *guest*, or *tung* for *tongue*. There is no excuse, however, for *thru* (for *through*) from any point of view. The symbol *u* carries generally in English the value *vu* (in *use*) or *u* (in *but*); only very rarely, as in *rural*, *rumor*, has it the value *oo*. *Thru* has not even the authority of error.

The interests here involved are too serious to be treated craftily, or on the principle of the entering wedge. If these are all the changes to be made, they lack system, and are unworthy. If more are to be exacted, let us know what we are doing. The English tongue is our priceless heritage whereby we as a people and as individuals are made members of the widest community of intelligence and freedom in the records of mankind and sharers of the amplest traditions of vigor, integrity, and self-government, and it behooves us to deal considerately with it, and keep it in honor. This possession furthermore we hold in joint title with many peoples in many lands, and we may not ask for the portion of goods that is ours without injuring the rights of others and likewise impairing our own estate and the inheritance of our children. In the jealous keepership of our children and our children's children, the tongue in which our fathers spoke, the freedom of the individual man shall become with the unfolding of the years the chief instrument of unity and peace among all men.

Special Correspondence.

London.

Copper Mining in Ireland.—Interesting Revival of an Old Industry.—Good News from Cornwall.—Annual Meeting of Camp Bird.—A Fine Showing for Four Years' Work.—Milling at the Dolores. Tube-Mill Practice.—Record Output from the Transvaal Fails to Move the Share Market.

A recent issue of the *Irish Times* contains some interesting particulars concerning the antiquity and resuscitation of the copper mining industry in Bonmahon, County Waterford. Smith, in his 'History of Waterford,' calls attention to a manuscript of the Bishop of Clogher in Trinity College, in which mention is made of valuable mines in the neighborhood of Annestown or Bonmahon in the sixteenth century. The mines were worked in 1745 by a syndicate which had obtained a 31-years' lease, conditional on rendering an eighth-part of all the ore obtained to Lord Ranelagh. According to Smith, "the works were carried on with great spirit and tolerable success; but a want of union among the members of the company, injudicious arrangements, and, above all, unfaithful men as managers, checked the progress of the undertaking, and it was at length abandoned." Redmond, in his 'South-East of Ireland,' continues the story as regards more recent times, and tells us that The Mining Company of Ireland was formed in 1824, with a capital of $500,000, of which, roughly speaking, about quarter of the amount was paid up. The success of that portion of the undertaking relating to the working of the copper mines was so great at first that the shareholders received in dividends more than twice the value of their shares. But as time rolled on, competition so increased that the value of copper fell, and as it was found unprofitable to work the mines they were closed down in the year 1870. Coming to more modern times, the two companies which early in the present year took in hand the Bonmahon mining work are being rewarded with success. A considerable amount of rich copper ore has already been won and dispatched, and it is reported that a thorough survey has enabled the engineers to trace lodes inland from the sea for three and a half miles in the direction of the Comeragh mountains, and it has also been ascertained that the lodes extend beyond the town of Kilmacthomas, five or six miles away, which village is the nearest place on the railway.

The news from Cornwall is looked upon by the local correspondents as encouraging. Wheal Kitty, St. Agnes, lying to the east of West Kitty, is to be floated on the limited liability system, under the name of Wheal Kitty and Penhall's United. Several local men are said to be taking up some thousands of shares, and it would appear that no difficulty will be experienced in raising the necessary capital. In various parts of the county mining is being prosecuted with vigor. A small syndicate, operating in one shaft on the Great Consols sett at St. Agnes, has raised a valuable quantity of ore during the past few weeks, but, owing to the scarcity of water, will have to postpone stamping until the early part of the winter. At Dowgas underground work is being pushed forward, and already there are indications of riches. A plant sufficient to treat 100 tons of ore per day is being laid out. The Wheal Grenville 'bob' at Goold's Shaft which snapped in two the other day and very seriously damaged the engine and other machinery, was 29 years old, and weighed 23 tons. The split took place in the thickest part and the huge piece of iron went in two, like matchwood. Per contra the Grenville new tin-dressing plant has just been completed. Your Redruth correspondent hits the mark in his reason for new capital not flowing more freely into the county. In plain language, however, there is not sufficient inducement to the promoter. People who are willing to take the trouble and risk of finding capital for such a highly speculative venture as Cornish tin mining expect due consideration. They do not see why all the money should "go into the mines" for the sole benefit of the stockholders.

At the fifth ordinary general meeting of Camp Bird Ltd. last week, Mr. A. M. Grenfell, the chairman, was able to make a good showing for the mine. According to Mr. A. C. Beatty's report the gross earnings during the last four years amounted to $8,153,000, out of which £676,000, or 82½%, had been paid on the total capital, without counting the £115,000 now in hand, which is equal to a further 12%, that is, nearly 95% of the capital had been earned during the last four years without taking into account an estimated profit on the ore in sight of £881,000. From the balance of £115,020 will have to be provided £70,000 for the reconstruction, leaving an undivided surplus of about £45,000. It is expected that crushing will be resumed before December 1, the date originally estimated by the engineers. Mr. Beatty and the Chairman came to the conclusion that, provided it did no harm to the future working of the mine, it would be advisable to start by attacking some of the richer stopes and put high-grade ore through the mill, thereby making larger profits than the average, and so recover the company's financial position as soon as possible, provided that Mr. W. J. Cox, the manager, would adopt such a policy and that it can be carried out without in any way injuring the mine. It is hoped to resume dividend payments soon after the first period of crushing. In passing the usual vote of thanks to the staff in America and their assistants, special reference was made to the services of Mr. Thomas Woods during the fire at the mill.

Dolores circular just issued brings up the information about the mine to the end of July. The tonnage milled for that month is reported as 1,350 tons. Of this total 368 tons came from the mine for amalgamation. The bulk of the remainder came from the dump for cyaniding, while some 200 tons odd of old tailing were re-treated. The total production as called for by the assays is estimated at about $49,500 for the month. As pointed out in the May report, a part of this extraction, some $7,500, would remain in the cyanide plant, a condition which is not expected to be obviated until after August. From the $42,000 value of the bullion recovered, a profit of $22,000 is reported for July, after deduction of $20,000 for operating expenses. In explanation of the milling not having reached the full running capacity Mr. John B. Farish reports as follows:—"The principal delays in the mill have been caused by the continual choking of the cone-classifiers. These were designed and built according to the best possible usage, but the ore of the Dolores seems to require in this respect, and in the tube-mill a different arrangement from that of our practice. We are now installing a mechanical classifier which we hope to have running in September, and which I think will give us better results than we have been able to obtain with the most improved cone classifiers. The tube-mill has proved a dissappointment in one way. The engineers, and our own experience, indicated that it would have ample capacity to handle all of the pulp from the 15 stamps. This was apparently confirmed by the tests made at the Creston Colorada; but the tube-mill erected at the Dolores was in one way an experiment, being the first sectional one ever built. It has performed its work excellently, but has been unable to slime the total pulp produced by the 15 stamps. Our crushing facilities are ample to take care of more ore than the 50 tons daily of

crude material for which the mill was designed, but as indicated above, the tube-mill and the cone-classifiers have not yet been able to take care of the product turned out by the crushing department. To remedy this we shall either install an additional tube-mill or grinding pans for sliming the material. I have already pointed out that one of the most important features in opening and equipping a new property has been satisfactorily solved, that is, the treatment of the ore. Upon the completion of this additional machinery, namely, concentrators, mechanical classifiers, an additional tube-mill, or grinding pans, and possibly an additional agitating-tank, the mill will have the capacity originally intended—1,500 tons per month—or what is more probable a capacity of over 1,600 and, possibly, 1,700 tons per month of crude mine ore." The development of the mine appears to be proceeding satisfactorily although slowly, owing to shortage of skilled labor. The main shaft has almost reached the depth of 550 ft., at which point the fourth level will be extended. In Mr. Farish's opinion the opening of the fourth level at the above-mentioned station in such ore as is shown on the third level, and with a width corresponding to that shown in the drift and cross-cut No. 1 will place in sight an additional tonnage and value of ore almost or quite equal to the amount figured by the experts as being in sight in the mine, at the time of the purchase of the property. Meantime he believes that a conservative estimate of the ore already opened in connection with the third level will equal the amount extracted and treated during the time the mill has been in operation; in other words, the ore reserves above the third level were not less on July 1 than they were at the time the property was taken over.

Another record output of gold in the Transvaal—509,115 oz. for August—has not served to lift the market for Kaffir shares out of the rut into which it again fell after the recovery during the holidays. A correspondent of the *Spectator* endeavors to find a new terror for South Africa in the possibility of the initiation of the black man by the Chinese coolies into the mysteries of the secret societies so much in vogue amongst the Asiatics. So far such knowledge, on the dark continent, is believed to be limited to West Africans.

Denver, Colorado.

Milling Methods at Idaho Springs.—The Yak Tunnel and its Increasing Output.—Dredging at Breckenridge.—Confused Politics in Colorado.

After several years of experimental work at Idaho Springs it seems probable that a large custom mill will be erected. The experimental work has been done by several different parties. Lafayette Hanchett, manager of the Newhouse tunnel, was one of the pioneers. He proved that many improvements could be made, but went to the Cactus mine in Utah before his idea for a large mill had been carried out. Then William E. Renshaw, manager of the Gem Consolidated, took up the investigation and built a mill of 40 stamps on the most approved modern lines. This mill did better work than anything built before, but still it did not quite solve the problem. Then Tanner & Anderson built a little mill and added a cyanide department. They showed that cyanide would work well on Clear Creek county ores if very carefully handled, but their unit was so small that they could not make a success of the low-grade material around Idaho Springs and turned their plant over to the treatment of Empire ores, where they secured contracts for higher grade stuff. There seems to be an immense tonnage of ore in the immediate vicinity of Idaho Springs that is generally spoken of as $5 stuff. It probably goes a little less. All well-informed men agree that the tonnage is enormous. Most of this low-grade ore has been developed while extracting bodies of higher grade ore, so that the cost of development need not be charged against it. The problem then is, to stope, haul and mill this stuff at a profit. Henry B. Clifford & Co., of New York, are said to be heavily interested in the Gem Consolidated and they have under consideration the plan of building a very large mill at Idaho Springs for the Gem ores and for custom work also. They have studied carefully the results already obtained locally, and have conducted experiments independently. It is said at Idaho Springs that plans are now being prepared for a mill of 1,000 tons daily capacity.

Another mine has become tributary to the Yak tunnel at Leadville. This adit is fast becoming a great artery of ore production. Electric haulage enables the ore-cars to rush along the adit at express train speed every few minutes. I believe each car holds three tons and nine to twelve cars go out in each train. The outer terminal is as busy as a city freight-yard. Ores from a dozen different workings are assorted and dumped with business-like system. Here is a car of high-grade carbonate for one shipment, there a car of low-grade iron for another shipment, here a car of zinc and lead for one part of the big mill, and there a car of low-grade galena for another department. Truly, as one stands at the portal of the great adit, the bug-bear of mining, that of finding the ore, seems to have been entirely eliminated from the problem and the only question seems to be that of systematically handling the product. The owners of the Louisville, Hanifren & Reynolds have arranged a connection with the Yak tunnel on their 600-ft. level. The shaft is 950 ft. deep. The water and ore will be raised from the lower levels to the adit level by electric power. The Yak tunnel put down two diamond-drill holes which revealed a body of iron sulpide 40 ft. thick on the lower contact extending into Louisville ground. There are large bodies of zinc ore already exposed in the old stopes of the Louisville and this ore will be taken out at once.

At Breckenridge, Ben Stanley Revett's dredge, the Reliance, which is working a small acreage in the midst of the big French Creek placer, is on the home stretch of a very successful run. The dredge did not get well started last season before it had to shut down. This year everything seems to have been favorable. There was plenty of water and good rich ground was encountered. The manager, Mr. McDonald, late of Oroville is enthusiastic and says the enterprise is an unqualified success.

Denver politicians were given a shock on September 18 by Philip B. Stewart, who resigned the nomination for governor. Politicians do not generally resign nominations, particularly when their party looks like the winner. Stewart does not like his running mate, Judge Gabbert, who is nominated for the Supreme bench. Gabbert took a prominent part in the cases arising from the late Cripple Creek labor troubles, and was so emphatically on the side of law and order that he got the name of being an enemy to organized labor. It would have been good policy to have left Gabbert off the ticket, but the way tickets have been cut to pieces in this State the last few years ought to have shown Stewart that his running mates could neither help him nor hurt him to any great extent. Henry A. Buchtel, chancellor of Denver University, has been nominated to take Mr. Stewart's place on the Republican ticket. Judge Ben Lindsey announces he is going to go it alone for the governorship. The judge has made himself famous by his Juvenile Court work. Many men will vote for the judge, because he is a good, honorable man, but people who know him think nature built him for a Juvenile Court and not for a governor.

Butte, Montana.

Butte Men Operating in California. — North Butte Increasing Output. — Important Discovery in the Ophir. — Good Ore in the Simons Mine of the East Butte Co. — The Lexington is Being Pumped. — Taxes Paid by the Amalgamated Company. — Repairs to Several Shafts Curtail the Output.

The organization of the Furnace Creek Extension Mining Co. has been perfected in Butte. It has been incorporated with a capital stock of $5,000,000, divided into 1,000,000 shares of the par value of $5 per share. Officers have been elected as follows: President, George W. Irvin; vice-president, John MacGinniss; treasurer, R. B. Nuckolls; secretary, H. F. Collins; board of directors, in addition to the three officers named, J. D. Slemons, A. J. Campbell, and Fayette Harrington. The company has 11 copper claims in Inyo county, California, adjoining the property of the Patsey Clark Co., and a few weeks ago a large vein of copper ore was cut in the course of exploratory work.

The North Butte Co. is at present shipping an average of 1,000 tons of ore per day to the Washoe smelter at Anaconda, and is employing 700 men. The company each month uses 650,000 ft. of lumber, but the amount will be increased to about 1,000,000 ft. within a short time. Since it began operations the North Butte Co. has paid $57,618 for machinery. It paid out for labor during the six months ending June 30, $383,656, but the payroll has been increasing since then, and in August it amounted to $70,000.——The Red Metal Co., a subsidiary of the Butte Coalition, produced 1,500 tons of ore daily until the first of September, when one of its big producing mines, the Minnie Healey, was shut down to permit repairs to be made to the shaft. Since then the company has been shipping about 1,100 tons per day. The company employs 988 men. —— The Butte & Bacorn Co., which is developing a group of copper properties in the new district north of Butte, has reached a depth of 400 ft. with the shafts on the Belinda and Calumet claims. The Colleen Bawn shaft, which is on the principal claim of the company, is in bad ground and the company has had a great deal of difficulty with it, progress in sinking being slow.

A large body of silver and gold ore has been discovered on the 200-ft. level, 500 ft. east of the shaft, in the Ophir mine, owned by the newly organized Butte Central & Boston Copper corporation. A cross-cut is 40 ft. in the orebody, all of which is shipping ore, assays showing 60 oz. silver and $4 in gold per ton. The vein is 60 ft. wide at that point and the indications are that the orebody fills the vein. It is apparently one of the largest silver deposits ever discovered in the Butte district. About 100 ft. east of the shaft on the 300-ft. level a bunch of ore was discovered a few weeks ago which carries a good percentage of copper, and the opinion of Manager McConnell is that both discoveries belong to the same orebody, and that the vein will be found to turn into copper at greater depth. The mine is being worked by lessees. The company's work has been confined to sinking the shaft, which has been sunk from a depth of 300 to 500 ft. A station, 16 by 30 ft. and 10 ft. high, has been put in at the 300-ft. level.

The East Butte Mining Co. has resumed work on the cross-cut being run north and south from the 400-ft. station, and it is expected that some of the known veins will be encountered within a month. Work was stopped some time ago because of the proximity to the veins and the fear of a flood of water, which the company was not at the time prepared to handle. A large pump has been installed at the 400-ft. station. Lessees working the Simons mine of the East Butte group are extracting some of the richest copper ore mined in the Butte district, assaying 20% copper. James W. Neill, consulting engineer to the company, has been in Butte several weeks inspecting the work and exploration being done, and has made a report, of a very encouraging nature, to the stockholders. He says one of the biggest sources of revenue is the precipitating plant built on the company's ground by lessees who are paying 25% royalty on the copper recovered from the old Parrot smelter tailing which covers about eight acres of East Butte ground to a depth of 5 to 25 ft. The plant, which was built at a cost of $30,000, will revert to the company at the expiration of five years, after which it will be operated by the company itself. Mr. Neill says it will earn a big profit for at least 20 years. The company also expects to be mining ore on its own account within a few months.

La France Co. has lowered the water in the old Lexington mine to the 1,000-ft. station, which leaves 450 ft. more to be pumped out. As the workings are extensive, the work of unwatering will be slow. It will be several months before the mine is completely cleared.——The Davis-Daly Estates Co. is now sinking on the Silver King, Mt. Moriah, and Colorado claims, and it is announced that exploratory work will also be done through the Smokehouse shaft, which is situated at the corner of Broadway and Wyoming streets. It has been the intention of the company to use the Smokehouse only for purpose of ventilation, but recently workmen engaged in excavating for a cellar about 150 ft. west of the Smokehouse shaft cut a large copper vein, which prompted the company to explore the ground thoroughly through the Smokehouse. The shaft is 500 ft. deep and Manager Palmer expects to hoist ore from it within two months. ——The Butte-Milwaukee Co. is raising some ore from the 250-ft. level of the Pollock mine, and will go after the vein also on the 350-ft. level. The Pollock is equipped with a fine hoisting plant.——The East Butte Extension Mining Co. is shipping about 40 tons of ore per day from its four producing shafts. The ore assays 7% copper.

The Amalgamated Copper Co. owns property in 16 counties of Montana and pays taxes on a total assessed valuation of $26,911,857. The Washoe smelter, built at a cost of $9,500,000, is assessed for only $3,100,000, and all of the company's properties are assessed at the same ratio to their actual value. Its greatest assets are, of course, its mines, which are assessed and taxed only at $5 per acre, but the company pays taxes on the net proceeds of the mines. The Amalgamated pays one-third of all the taxes collected in Silver Bow (Butte) county, and one-half of all taxes in Deer Lodge (Anaconda) county. The company's mines are situated in Butte and its smelter at Anaconda.——A report circulated in the East and telegraphed from Boston to the effect that John D. Ryan and Thomas F. Cole are to be added to the board of directors of the Greene Consolidated Co. is emphatically denied by Mr. Ryan. "I am not even a stockholder in the Greene Consolidated," he said. "So far as I am concerned there is absolutely no truth in the rumor. I feel certain that Mr. Cole has no intention of going on the board or I would have heard of it."

The Mountain Consolidated mine of the Anaconda Co., the Clear Grit of the Washoe Co., the West Colusa of the Boston & Montana Co. and the Minnie Healey of the Red Metals Co. are still closed and will not be reopened until late in October. The shafts of all except the Clear Grit are being repaired, and the Clear Grit had to be closed because it was mined through the Mountain Consolidated. The suspension of the four mines reduced the daily output of the Butte district about 1,200 tons daily during September. The Minnie Healey will use the old shaft, when repaired, only temporarily, as it is unsafe. A new shaft

is being sunk on the Tramway by the Red Metals and Butte & Boston companies, and eventually the Minnie Healey will be worked through that property. The new shaft on the Leonard, a Boston & Montana property, has been opened to a depth of 1,200 ft. and is ready for use, but the surface equipment has not yet been completed. ——The shaft on the Butte & London property, the Greendale, is 620 ft. deep. Nothing has yet been encountered to indicate the close proximity of a vein. The shaft may be sunk to a depth of 1,500 ft. before any cross-cutting is done.——The Farrell Copper Mining Co. has elected the following officers: President, W. C. Lewis; vice-president, Carlton H. Hand; treasurer, J. D. Simmons; secretary, Proctor Barclay. The company has secured title to 17 acres of ground in East Butte. It is capitalized for 400,000 shares at $2.50 each. The company will work the property through the shaft of the Alliance Copper Mining Co.——Work has been suspended on the property of the Butte Hill Copper Co., because of a hitch in the negotiations for floating the company. Some St. Louis capitalists are willing to put up the money to develop the property, but not on the terms proposed by the promoters.

Toronto, Canada.

A Useful Bequest.—Dredging on the Yukon.—The Laurentian Mine.

The will of the late Æneas McCharles, of Sudbury, Ont., bequeaths $10,000 to the University of Toronto as a fund, the interest from which is to be given from time to time: (1) To any Canadian inventing any new and improved process for the treatment of ores, of practical value; (2) for any important discovery or device by a Canadian for lessening the danger in connection with the use of electricity for power and light; or (3) for any marked public distinction achieved by any Canadian in scientific research in any practical line.

F. E. Folsom, of Toronto, who has recently returned from the Yukon, where he is interested largely in mining properties, states that dredge mining is proving very successful in handling the gravel of the rivers. A dredge is at work about half a mile up the mouth of the Klondike, with buckets of over 5 cu. ft. capacity, turning over 3,500 yd. of gravel per day. The ground is so rich that a new dredge, with buckets of 15-ft. capacity and equal in size to the giant dredge at Folsom, Cal., will shortly be installed. It is proposed in the near future to substitute electric power for steam in the operation of the dredges.

When sinking the main shaft at the Columbus mine, Cobalt, a cross-vein running at right angles from the main vein was struck at 52 ft., which was found to improve rapidly down to the 60-ft. level. The management is installing a complete steam-power plant, consisting of boiler, steam drills, pumps, and air blower.——John Ernst, of Ernst & Gowman, who published a map of the Cobalt area, blew out his brains at Haileybury on the 15th inst. He had been lately engaged in developing three claims, but his applications for location were thrown out by the mining inspector and he had suffered from despondency for some days. His home was in Detroit.

Anthony Blum, principal owner of the Laurentian gold mine in the Manitou Lake district, states that a million dollars worth of ore has already been blocked out. The working force has been increased by a large number of Finlanders. It is proposed to have a thorough examination of the mine made this fall by a prominent American mining engineer with a view of more extended development operations.——The will of the late Thomas G. Blackstock, of Toronto, has been entered for probate, showing a net estate of $350,000.

Mexico.

Meeting of the Geological Congress.—Its Truly International Character.—Lack of Discussion, Owing to Entertainments.—Defeats Purpose of a Scientific Gathering.—A Brilliant Affair.

The tenth session of the Congres Géologique International, which was held in the City of Mexico, September 8 to 14, was in many regards a notable meeting. The attendance was unusually large, over 600 members being enrolled. About one-third of this number was in actual attendance. The Congress was truly international in make-up, all the continents and most countries being represented. Mexico naturally furnished the largest delegation, followed in turn by the United States and the German Empire. Canada, France, Austria, Great Britain, and Russia were fairly represented, while one or two were present from Australia, Japan, the Philippines, Italy, Spain, Sweden, Hungary, and a number of other countries.

The social features of the Congress were particularly well carried out, the hospitality of the Mexican Government and citizens being so lavish as to be almost embarrassing.

Ten sessions were held for the reading of papers, but the variety of subjects proposed for discussion, and the number of titles submitted left practically no time for the active interchange of ideas and criticism which ought to have been one of the features of the occasion. This difficulty is one of growing importance in all scientific and technical meetings, and it is hoped that some way may be found to remedy it in future congresses.

Since the work for which the Congres Géologique was first called together has now been largely accomplished, the reading of papers and scientific discussions must in the future be given more attention unless the organization be devoted wholly to social purposes. There is evidence that it has already made dangerous progress in the latter direction. The elaborate and attractive excursions and banquets, which it has become customary to offer gratuitously or at nominal charge, attract the dilletante more than the worker and the very large numbers present defeat the main purpose of the gathering. The local committee in each case has no really adequate means of determining who among the applicants are worthy, and has customarily given all comers the benefit of doubt. A result is the enrollment as members of a large number whose chief qualifications are the possession of a vigorous appetite, an insatiable thirst and an ever present kodak.

The present Congress was no worse than several of its predecessors, if as bad, and yet there were present an English undergraduate who is not even studying geology, a Russian botanist, the secretary of an obscure natural history society in New York, and several others equally out of place. The presence of many of these was a simple abuse of the generous hospitality of the Mexicans, and it is to be regretted that Americans, as well as others, were guilty. Steps already have been taken to prevent a recurrence of this at Stockholm, where the Congress of 1909 is to be held. It is hoped that means may also be found to make the sessions themselves more interesting and valuable.

In the main the Mexican Congress will be remembered as a brilliant affair, reflecting great credit on Messrs. Aguilera, Ordoñez, and other members of the committee who contributed so much to its success. The excursions before and after the Congress were so arranged as to afford the visitors a generous sight of the mines and mining districts of the Republic, and from El Paso on the north to Tehuantepec on the south, there was a cordial welcome to all—Americans included.

Bisbee, Arizona.

Discoveries in the Huachuca Mountains.—Important Transfer Made.—Compressed-Air System at the Copper Queen.—Increased Output From the Shattuck-Arizona.—Encouraging Reports From Tombstone.

During the past week ore has been found at the Butte & Arizona property in the Huachuca mountains, and the Warren Realty & Development Co. is reported to have been taken over by the Calumet & Arizona Co. Formerly the Huachuca mountain mining district has not been looked upon favorably on account of the unreliability of a number of companies which operated there, but within the past year or two a number of responsible companies have entered the district, and good results have been obtained. The Butte & Arizona Co. opened up a rich sulphide orebody on Wednesday night. About two months and a half ago this company, composed of men prominent in the Amalgamated Copper Co., purchased the property. They immediately put a force of men to work, and decided to drive an adit, to find out in the shortest possible space of time if the property had any merit. This adit had been driven about 350 ft., when the face showed a full front of sulphide ore. A test was made, and it was found that the ore carried nearly 27% copper. Up to the present the drift is still in the same formation. The place for sinking the shaft has not been selected as yet, but the management states that no time will be lost in opening up the property.

It was rumored in Bisbee several days ago that the Warren Realty & Development Co. had been absorbed by the Calumet & Arizona. L. W. Powell, manager of the Cole interests in this district, left the city for Duluth on Wednesday afternoon, and it is stated on reliable authority that he will meet Thomas F. Cole and Hoval A. Smith there and arrange the details of the transfer. It is known that a large body of ore has been encountered on the Warren property, but the management will not give any details to the public. It is also stated that the American–Saginaw Co. will be absorbed by the Calumet & Arizona, but it is not likely that this will be consummated before the next meeting of the American–Saginaw directors.

A number of the delegates to the International Geological Congress, which was held at the City of Mexico, visited the mines of Bisbee, when returning from Mexico.——On the Copper Queen property the new Nordberg compressor is being erected at the Lowell shaft. At the present time compressed-air mains are being run from the Gardiner to the Czar shaft, to connect with that system, and as soon as this connection is made the entire air system of the Copper Queen mines will form a complete circuit. The steel work on the new machine-shop is practically completed, and the carpenters will be put to work this week. The raising of the new Holbrook shaft is being rushed, and will probably be completed within the next sixty days. The new electric pump for the Czar shaft was lowered into the shaft, and the work of installing it will be commenced this week.

At the Superior & Pittsburg properties everything is about the same as usual.——At the Calumet & Arizona most of the attention is being directed to the perfecting of the hoisting and pumping machinery.——At the Shattuck-Arizona the output was increased this week from 175 tons to 200, and from this time on the output will be increased steadily. The tramway is working satisfactorily. The new assay-office is being erected and will probably be finished within a couple of weeks. The new Allis-Chalmers hoist is expected to arrive this week, and as soon as it is placed in position the engine-house will be built and the Junction hoist returned to the owners. On the 600-ft. level the drift is showing up very well in a limestone formation. On the 700 two new stopes are being worked; one sulphide and the other oxide. On the 800-ft. level a new sulphide orebody was encountered on Friday. Both of the raises from the 800 to the 700 are in oxidized ore, and are being stoped.

At the Denn-Arizona, the drift on the 1,000-ft. level is showing up very well in manganese and iron. The crosscut that is being driven from the drift to the diamond-drill bore is progressing rapidly, with no material change from the formation in the drift. The new Prescott pump is expected to arrive this week, and will be installed at once. —— Reports from Tombstone are to the effect that since the new boilers were placed in position the water has been taken care of, making sinking of the shafts possible. At the present time 4,000,000 gal. water are being pumped every 24 hours. The main shaft will be sunk to the 1,000-ft. level, and a new pump, which is now on the ground, will be installed there. At the mill everything is running smoothly, 40 stamps dropping continuously, and crushing about 200 tons of ore per day. A tramway has been built from the tailing bed to the upper side of the mill, where the ore is hoisted into the bins.

Salt Lake, Utah.

Economic Mining at Mercur.—News from Tintic.—New Sampling Works at Salt Lake.—The Interstate Commerce Commission Investigating Railroad Rates.—Important Testimony.

The annual report of the Consolidated Mercur Gold Mines Co., operating at Mercur, for the fiscal year ending June 30, has just been issued and shows net earnings of $112,787, out of which were paid four quarterly dividends of $25,000 each; also $8,104 for construction, while the surplus at the end of the year amounted to about $126,000. The average of the ore treated was $3.76 per ton, which is an average of 19c. lower than last year, due to the handling of 75,000 tons from the Magazine vein valued at about $2.50 per ton. An average of 830 tons per day was mined at a cost of $1.41 per ton, while the mill costs showed an average of $1.07 per ton, making the total expense of mining and milling $2.48 per ton. Wherever practicable the management has been driving by contract, or piece work, and all such contracts have averaged $3.27 per shift, while miners have received from $2.50 to $2.75 per day. The mill tailing ran lower than last year; in September 1905 it was the highest, namely, $1.06; and in February 1906, it was lowest, 88c.; the average for the twelve months being $0.956 per ton.

The machine-men at the Grand Central and Victoria mines, in the Tintic district, have been granted an increase in wages of 25c. per day. They now get $3.25.—— The shaft at the West Mammoth mine is down 300 ft.—— An effort is being made to effect a permanent organization among the mine owners and operators of the Tintic mining district. The interests of that camp have been acting in concert for some time in working with the railroads to grant a reduction in freight-rates to the Salt Lake smelters.

An important strike has been made on the 1,000-ft. level of the New Stockton mine at Stockton. Copper is appearing in the Leopard vein, indicating that as depth is attained, that metal will cut an important figure. —— Last week's ore and bullion settlements aggregated over $500,000, while during the same period on the Salt Lake Stock & Mining Exchange, 442,500 shares were sold, for which was paid $213,997. —— Excavations have been made for a new sampling mill near Salt Lake, the same to be built by the Taylor & Brunton Sampling Co. —— The plan of the Continental Mines & Smelters Corpora-

tion, which acquired a right-of-way from the Rio Grande Western railway, to build a railroad into the camp of Alta, seems to have fallen through.

The gasoline engine at the hoist of the Magnolia St. Louis mine at Park City is being replaced by a larger steam-plant.——The mill at the Cactus mine of the Newhouse Mines & Smelters Co. in Beaver county is giving treatment to 800 tons of ore daily. Forty per cent of this tonnage is mined through the square-set system and the balance by the steam-shovel or glory-hole method.——Encouraging reports have come from the Sevier Consolidated mine in the Gold Mountain district, which the management has announced is now self-sustaining. An additional conical classifier is being added to the mill, which will bring the plant up to its capacity of 125 tons per day. Conditions in the mine are most satisfactory. Some exceptionally high-grade goldore for this district has been recently developed.

The Interstate Commerce Commission has begun an investigation at Salt Lake. The hearing started on the 24th inst. and up to this time it has been centered on the alleged discriminations of the Harriman railroads in favor of the three big coal companies of southwestern Wyoming. Many witnesses have been subpœned and indications are that some sensational testimony will be brought out and that the railroad management will be placed in an unfavorable light, as well as those who have directed the management of the coal mining concerns. The coal companies involved thus far are the Kemmerer Coal Co., Diamond Coal & Coke Co., and Union Pacific Coal Co. An attempt is being made not only to show that these coal mining concerns have acquired vast areas of coal-land by fraud, but that the transportation companies have discriminated against certain dealers in Salt Lake and elsewhere by a secret system of rebates and other means. One Salt Lake dealer, D. J. Sharp, who had been in the retail business in Salt Lake for a number of years, gave some interesting testimony to the effect that because he had advertised to sell coal at $4.75 per ton during the past summer, giving the customer the benefit of the summer storage rate, amounting to 50c. per ton, he was forced out of business by the railroads refusing to haul coal consigned to him. The investigation will not be confined to the Wyoming field alone, but the Gould lines and the closely allied coal companies are charged with offences equally grave. The hearing will probably not be completed for some time.

Cripple Creek, Colorado.

Steady Output from El Paso.—The Lonaconing Doing Well.—Transfer of United Gold Mines to Golden Cycle Co.—The Christmas Making Steady Shipments.—Rich Ore in the South Dante.—Telluride Mill Rebuilt for Cyanide Work.

An average of two cars of ore per day has been shipped this month by the El Paso Gold Mining Co., on Beacon hill. The ore runs about $40 as shipped and is obtained from the upper four levels of the mine. This steady production accounts partly for the rise in the value of the shares which has taken place recently.——Carlton and associates, leasing on the Lonaconing mine, situated on the west slope of Beacon hill, have shipped eight cars of ore this month, which have averaged better than 1½ oz. per ton. Work is being carried on by machine-drilling both north and south of the shaft at a depth of 300 ft., the orebody averaging four feet wide.

The most important news of late is the transfer of the properties of the United Gold Mines Co., formerly controlled by the Woods Investment Co., to the Golden Cycle Gold Mining Co. The purchase price is said to be in the neighborhood of $350,000. These properties, which include the Wild Horse, Deadwood, Damon, Hardwood, Trachyte, Silver Tip, and the W. P. H., will be extensively worked by the Golden Cycle Co., which is one of the most progressive in the district. It is said that the above properties, and those under lease to the Western Investment Co., will be run in conjunction, as several of the latter company's officials are also directors of the Golden Cycle Company.

Low-grade ore is being shipped to the Van Fleet cyanide plant near the town of Goldfield from the Carper lease on the War Eagles mine, on Bull Hill. This mill was formerly a sampler, but has lately been converted into a cyanide mill for the treatment of low-grade oxidized ores.——A lease has recently been obtained by Sherman Bell on the Apex claim, on Bull hill, belonging to the San Juan Company.

A small two-drill compressor is about to be installed on the West lease of the Free Coinage Co. near the town of Altman. Lessee West recently opened up a body of ore in the Pinto shaft of the above property.—The indebtedness of the City of Cripple Creek Gold Mining Co., amounting to approximately $3,600, has been paid off by the shareholders, who intend to start active development work on company account. A cross-cut driven on the 450 ft. level is said to be within 40 ft. of the Abe Lincoln vein, which is expected to yield pay-ore.

The Christmas mine, under lease to Becker, Travell & Co., is yielding a car every other day of good average grade ore, which is being obtained from the 700, 800 and 900-ft. levels. Next month a five-drill compressor will be installed, owing to the La Bella lease, which has up to the present supplied the Christmas mine with air, closing down their compressor plant. When the drills become available, it is expected that a car of ore per day will be shipped.——The British American Mining Co., Ltd., leasing on the South Dante, situated on the south slope of Bull hill, is shipping ten cars of ore per month. The stope from which most of this ore is being obtained and which is approximately 60 ft. long, is showing up well in both the north and south ends. On the east wall of this stope a cross-vein 6 ft. wide was encountered, which has been followed for 15 ft., the ore averaging $25 per ton. Good ore has also been opened up 40 ft. south from the raise on a north and south vein, the average grade here being $30 per ton. The winze under the stope, where the main part of the work is being carried on, is down 20 ft. and the assays at the last sampling ran as high as $150 per ton. The sinking of this winze has been stopped, as enough ore is being broken in the stope and cross-veins to keep the ore-house full. Driving from the Cody shaft, at a depth of 125-ft., on the north Granite property, on Battle mountain, by Fry, Becker & Co., is progressing in a north and west direction to the boundary lines. It is hoped that several veins, which should extend through the claim, will be cut.

The old Telluride mill at Colorado City, known now as the Golden Cycle mill, is rapidly nearing completion and will be running by November 1. This mill formerly belonged to the General Metals Co., the bromide process being used for treating the ores of the Cripple Creek district. The process was a failure, the company going bankrupt. The plant was then purchased by the Golden Cycle Gold Mining Co., who have remodeled it, installing the cyanide process under the direction of Philip Argall. The cost of this work has been in the neighborhood of $200,000. The capacity of the mill will be approximately 250 tons per day, of which amount the Golden Cycle mine will furnish 150 tons when the improvements that are now being made on the mine shall have been completed.

Mining Summary.

ARIZONA.

(Special Correspondence).—The Storm Cloud mine in Hassayampa district, Yavapai county, is reported to have over two feet of ore worth $60 per ton, and 1,200 tons of such ore on the dump, all of which was taken out in development work. E. E. Breeden and other parties sold seven claims in the vicinity of the Storm Cloud mine lately to a close corporation of Eastern capitalists, who will start work right away on a double-compartment shaft of 1,000 ft. The purchase price is said to be $35,000.—— Eli Hilty, of Kingman, is in Yuma looking for a lost mine, but so far has been unsuccessful in his quest. Many years ago Hilty found more than a ton of float, but could not find the vein. This float netted himself and partner several thousand dollars. With many years of experience in mining, the plucky prospector believes he can find the source of the rich float, and will put in several months making a systematic search.

Prescott, September 22.

COCHISE COUNTY.

The Tombstone Consolidated 10 by 24-ft. shaft is down 900 ft. and is being sunk as rapidly as three 8-hour shifts can do the work. It is the intention to push the work to the 1,000-ft. level before any other stations are cut or new drifts run. When that level is reached another pump will be added. At present the pumps are handling 4,000,000 gal. daily. In the shaft there are two sinking pumps that send the water to the 700-ft. level whence it is pumped to the surface by the station pumps; the pump on the 800 raises the water to the 600-ft. level, where another pump sends it to the surface. The steam-plant consists of a battery of eight marine boilers with 1,600 h.p. A new air-compressor furnishes power for the machine-drills. A tramway is being built from the big shaft to one of the old dumps so that the ore can be delivered into the ore-bins and then run through the mill. There are several thousand tons of this ore that was taken out when the shaft was sunk that can now be milled at a profit. At the mill 40 stamps are crushing 200 tons of ore per day and the cyanide plant is handling the same amount. Superintendent Tyndall is making arrangements to handle the old tailing bed. A tramway has been built to the upper side of the mill, where a small hoist will haul the loads of tailing and deliver into the ore-bins.

It is reported that the Butte & Arizona Copper Mining Co. has found rich sulphide ore after driving its adit 350 ft. in its Huachuca mountain property south of Bisbee. Thomas E. Stafford is superintendent.

COCONINO COUNTY.

The Hance Asbestos Co., of New York, will resume operations at its asbestos mines in the Grand canyon on October 1. H. H. Smith, resident manager at Grandview, says that the mines will be worked with 20 men, and the product will be shipped as rapidly as possible.

GRAHAM COUNTY.

The Gold Belt Development & Reduction Co. is shipping ore to the Shannon smelter at Clifton, as the wagon-road has been finished. About 100 tons of high-grade copper ore is on the dump and arrangements are being made to put men in the mines. Another strike has been made on the Comstock in addition to the first big strike. —— The New England & Clifton Co. will start a development shaft on the Antietam mine, near Metcalf, as soon as a hoist can be installed. The company is now shipping daily 45 tons of ore to the Shannon smelter from the Old King mine. It is likely that the shipments will soon be increased to 50 tons daily.

YAVAPAI COUNTY.

The Tiger Gold Co. at Harrington has 125 men on the payroll. The company is putting in a large double-drum hoist and 200-h.p. boiler. It is continuing its double-compartment shaft, which is now down 350 ft. The 20-stamp mill has been in operation continuously for two years. The concentrate is shipped to the smelter at Humboldt. As soon as the new hoist and boiler are installed it expects to double the milling capacity.——The Sepoy Mining Co., formerly the Apache Panther Co., is working a full crew of men and is driving the tunnel with compressed air. The company has built a wagon-road from Crown King, about two miles north, to its mine.

It is reported that a five-foot vein of good ore has been found at a depth of 250 ft. in the shaft of the Pittsburg-Jerome mine, near Jerome. —— Diamond-drill holes are being sunk on the Verde Chief and the Harryhousen mines near Jerome, and late reports indicate promising results.

CALIFORNIA.

An interesting demonstration of a new explosive was made on September 21 near Berkeley, at the quarry of the Spring Construction Co. The series of tests were of the usual character, to demonstrate safety features, insensibility to shock or concussion, absence of noxious fumes, and perfect security in case of combustion. This new explosive is manufactured for shipment, in two separate compounds, designated respectively, No. 1 and No. 2. The former is a white substance, not unlike fine table-salt ; the latter is of a golden yellow color. The safety features were exploited by vigorously pounding the compounds separately ; and again, after the two compounds had been thoroughly mixed. In neither of these tests were there any explosions. Burning the compounds separately, and then combined, was the next test, which demonstrated that there were no noxious fumes or unpleasant odor after combustion. A pistol bullet was then fired through a cartridge containing the combined compounds, without exploding. The same powder that had been put through these tests was then placed in a paper cartridge, and successfully detonated in the open. The disruptive energy of the new explosive showed most excellent results in 'bulldozing.' A five-foot horizontal hole was charged with ten ⅞ by 6-in. cartridges, and set off with most excellent shattering results. Among those in attendance who witnessed these tests were Prof. W. B. Rising of the University of California, F. F. Thomas of the Gwin mine, Louis T. Wright of the Mountain Copper Co., T. A. Rickard of the MINING AND SCIENTIFIC PRESS, R. Gilman Brown of San Francisco, Louis Rosenfeld of the Eagle-Shawmut Mining Co., M. J. McDonald of the Keystone Consolidated Mining Co., Wm. Sharwood of the Soulsby mine, E. T. Blake of the Oakland Paving Co., W. H. Shockley and B. F. Edwards of Tonopah, Wm. Schmidt, John E. Porter, and John Brown of the Spring Construction Co., W. P. Doyle, F. L. Little, John Mason, the inventor of the new powder, and A. B. Murray of the American Safety Powder Co. The opinion of all those present was most favorable, and the demonstration was satisfactory in every way; it was given under the direction of George W. Myers, of Berkeley, the contracting agent.

KERN COUNTY.

(Special Correspondence).—The Kern County Consolidated Gold Mines, Ltd., has bought the Old Piute mine from H. B. Chase and associates, and has commenced to develop the property on a large scale. A new hoist, air-compressor, sawmill, etc., have been installed. Twenty men are working, and more will be added as fast as they can be obtained. The purpose of the company—composed mainly of French stockholders—is to enlarge their scope by acquiring other worthy properties in this district. F. W. D. Gwynne is manager for the company, and Wm. L. Cobb consulting engineer.

Piute, Cal., September 24.

MONO COUNTY.

A prospecting drill is to be placed on the Dondero ranch north of Mono lake and the ground tested for oil.——The Masonic Mining Co. will start work on the recently acquired True Friend claims at Masonic under the management of John Philips.

SHASTA COUNTY.

The 700-ft. raise at the Midas mine, Harrison gulch, has been completed after nearly a year's work. A new hoist will be put in, as this is to be made the main working shaft.

SISKIYOU COUNTY.

Over 300 mining location notices have been filed for record in this county during the last two weeks. Nearly all the no-

tices concern locations of claims on the copper belt along the Klamath river, extending from the mouth of Humbug creek to the State line.

TUOLUMNE COUNTY.

(Special Correspondence).—A boiler and pump have been purchased for the Louisiana mine, one mile north of Tuolumne. When installed the work of unwatering the mine will be begun again. After having lowered the water to the 300-ft. level the work was abandoned several months ago, owing to lack of machinery. —— Unwatering the shaft of the Crystalline mine was begun three weeks ago and is now half done. It is the intention of C. W. Ayers, the superintendent, to drift south on the vein from the bottom of the shaft. —— J. Ross Clark, J. S. Davies, and R. A. McWilliams have assigned their interests in the Patterson mine to the Pyrenees Gold Mining Co. in consideration of 600,000 shares of the capital stock of the latter concern. The deal is simply the formation of a new corporation to better handle the business of the Patterson mine. Mr. Clark is president of the Pyrenees Gold Mining Co., and Mr. McWilliams, secretary. —— Sinking has been resumed at the Longfellow mine at Big Oak Flat. The force has been temporarily reduced. The mill is kept in steady operation.—— The Springfield Tunnel & Development Co. has been organized. The principal place of business is Springfield, Tuolumne county, and the directors are W. M. Hall, W. A. Roth, A. G. and A. L. Horner, all of Oakland.——A 25-drill air-compressor has been installed at the App mine. —— At the Harvard, on Whisky hill, 60 men are employed, and 30 stamps are dropping. —— Operations have ceased at the Black Oak mine, near Soulsbyville. —— It is reported that rich ore has been uncovered at the 1,500-ft. level of the Jumper mine. —— At the Columbia mine, near Columbia, sinking is in progress. The shaft is over 100 ft. deep, and when it has reached a depth of 200 ft. driving north and south on the vein will be commenced. A cross-cut adit will also be run east to tap the Plummer shoot and another will be driven to cut the west vein. A tramway from the shaft to the mill has recently been completed and the mill was started up a few days ago.

Tuolumne, September 24.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Georgetown Loop Mining Co., owning 25 claims on Republican mountain, has its main adit in 300 ft. A good lode is exposed in the breast; this is believed to be the South America, which produced largely from surface workings many years ago.——B. J. O'Connell, leasing on the Frostberg lode of the Mendota mine, shipped 74 tons of lead-zinc ore to the Independent mill last week for concentration, the result being 20 tons of clean blende concentrate, 25 tons galena and 5 tons pyrite. Mr. O'Connell has also a 65% lead ore, which is shipped direct to the smelter through the Independent Mill Company.—— Charles Schrager and Theodore King shipped 700 lb. ore from their Rainbow property near Hale valley which netted them $1,000. Besides this extraordinary ore they have a 10-in. vein of galena which runs 238 oz. silver per ton and 50% lead. An assay made of some specimens from the property gave 19,604 oz. silver per ton. Buildings are now being erected and everything will be put in shape for continuous winter work.——At the Arapahoe group, covering 11 claims northwest of Argentine pass, owned by Charles Gilleen, Tom Cunningham & Co., although no extensive work has been done, an orebody 35 ft. wide has been exposed in the upper adit, all of which is first-class concentrating material. Near the mouth of this adit there are 12 inches of rich ore. The outcrop of one lode is 30 ft. wide, samples assaying from 50 to 200 oz. silver, ½ to 12 oz. gold per ton and 40% lead.——The Alaska Tunnel & Mining Co., operating on Leavenworth mountain, has been driving on the Germania vein. In the upper adit the Queen lode is 26 ft. wide where cut at 450 ft. from the mouth; it carries many small streaks of mineral in a fine gangue.——A 70-ft. bridge across Clear Creek above Silver Plume to the Josephine mine has been completed, also a boarding house and ore-bins. The adit is in 1,000 ft. and for 100 ft. back from the breast there is a continuous vein of galena, varying in width from 6 to 18 in., and carrying lead, gold, and silver in paying quantity.——Wm. Jacobs has given a two years' lease and bond on his Star group in Geneva gulch to John O'Day & Co. No work has been done on the property since 1894. The ore is said to assay 480 oz. silver per ton and 25% copper. The lessees have started a new adit which will cut all the four veins of the group in 500 ft. and give a depth of 250 ft.——The Lebanon is another old property which has recently re-commenced shipping. Mr. Maxton, the present lessee, shipped 25 tons of $40 ore to the Independent mill this week. Shipments will probably be continuous from now on, as the water-power has been put into service to operate the air-compressor, and the workings are in fair shape.

Georgetown, September 21.

MINERAL COUNTY.

(Special Correspondence).—While there is no boom in this district, yet the mining industry is as prosperous as it has been for many years. The output from this point is close to 6,000 tons per month. A large percentage of this is concentrate.——The East Willow Mining Co., Charles Loughridge, general manager, is installing a 20 by 24-inch Norwalk compressor, which was furnished by the Hendrie & Bolthoff Co., of Denver. Mr. Loughridge is making preparations to do a large amount of work as soon as the machinery is in position.——Dewey & Co., of Denver, has a lease on the Mexico. This mine has been idle for a number of years. At present considerable zinc ore is being produced from the old workings as well as some lead which is being put through the mill on the property. David D. Dewey has charge of the mine and mill.——The Crude United Mines Co. is handling 125 tons of ore per day. The ore is sorted in the mine before being brought out for treatment through the mill or for shipment to the smelter.——The new Amethyst mill is also handling a large tonnage.

Creede, September 12.

OURAY COUNTY.

(Special Correspondence).—Sometime during last July, Walter H. Bunce, general manager of the Chipeta Tunnel Co., started operations about 175 ft. below the old workings of the O. and N. property; he will drive a 7 by 7 ft. tunnel 2,000 ft. At this point he expects to make an upraise to the American Nettie quartzite, where a search for mineral will begin. Mr. Bunce formerly operated on the O. and N. and American Nettie properties, and is of the opinion that by driving a tunnel this distance and raising he will be able to open up some fine ore similar to what was taken out in former days. These old properties have produced approximately $2,000,000. Mr. Bunce is installing a plant of machinery consisting of boiler, Ingersoll-Rand compressor, etc. The plant will be placed several thousand feet below the tunnel portal, where it will be convenient to secure fuel from the railroad. Eastern parties with ample means are behind the enterprise. Michael Collins, foreman for Mr. Bunce, will have charge of the active operations. About 40 men will be employed when the machinery is installed.

Ouray, September 20.

SAN JUAN COUNTY.

(Special Correspondence).—Mining conditions are certainly improving in this district. During the past few months a number of mills that were started last year have been completed and are now producing. The Gold Prince mill, at Animas Forks, is now under cover and the machinery is being installed as rapidly as possible. The foundations are of concrete and the building is made of steel. The machinery is being furnished by the Denver Engineering Works Co. When completed, this mill will be one of the finest and most up-to-date in Colorado.—— The Sunnyside mill at Eureka is being enlarged and it is expected that the capacity of it will be doubled when the improvements and alterations are completed.——The Consolidated Eureka Co., operating in Niagara gulch, is driving an adit to tap the veins on its property some 1,500 to 2,000 ft. below the surface. The adit is now about 1,000 ft. long and a contract has been let to Samuel Davis to drive another 1,000 ft. As soon as the mine is properly developed, it is the intention of the manager, Nathan Gregg of Denver, to erect a mill suitable for the handling of the ore. It is

estimated that there is sufficient water coming from the adit to supply a good-sized mill. The power necessary to operate could be secured from either the Animas Power Co. or the Telluride Power Co., both of which are doing business in the vicinity.

The Old Hundred Mining Co., of which Howell Hinds, of Cleveland, Ohio, is principal owner, is doing a large amount of development work in the mine and operating the mill, which was erected last season. The aerial tramway which connects the mine and mill, is made in three sections on account of the grade. The first section is 1,700 ft. long and reaches from the lower terminal on the line of the Silverton railroad to No. 1 tunnel with a vertical rise of 829 ft; the second section is a jig back 750 ft. in length on the slope from No. 1 to No. 2, with a rise of 525 ft; and section No. 3 extends from No. 2 to No. 7 tunnel, a distance of 1,700 ft. with a rise of 1,081 ft. This tramway was built in the dead of winter and anyone familiar with the San Juan country at that season of the year can comprehend the difficulties that had to be overcome in the construction of this tram. It was necessary to build a trail from the gulch some miles in length on the side of a precipitous mountain to a point 500 ft. above the upper terminal, where the material was packed on burros and afterward lowered in a chute by ropes to where it was to be used. The tramway passes through the crusher building at the top of the mill, and after the ore is dumped it passes over a grizzley, the fine going over a Robins belt-conveyor to the ore-bins to be distributed by a mechanical distributer to the various bins above the stamps. The coarse ore passes through a No. 5 McCully crusher and thence to the belt-conveyor. The stamps are fed by suspended automatic feeders. The mill contains forty 1,350 lb. Boss stamps of eight batteries, each battery containing five stamps. The ore is crushed to pass through a 20-mesh screen and passes over 12 ft. of plate in front of each battery; after leaving the plates it passes through quicksilver traps and through sizers to a row of eight Card tables. The middling from these tables is carried to the floor below, where it is re-concentrated on eight more Card tables. The concentrate from the tables descends through pipes to dewatering tables in the lower part of the mill, where a large percentage of the water is taken out and the concentrate goes to automatic driers and from the driers to bins below, where they are sacked for shipment. Arrangements are being made to run the slime from the tables to settling-tanks and thence over Sperry slime-tables. The mill is handling 100 to 125 tons per day and making three to five tons of concentrate. Robert W. Davis, Jr., is general manager.

Silverton, Colo., September 17.

SUMMIT COUNTY.

(Special Correspondence).—A combined London and New York syndicate has been making drill-tests at the North American placer on Swan river. The work has been going on for three months with three drilling-machines constantly in operation. Mr. Tuttle is superintending the work. The ground owned by the company is known to contain some rich patches, but affairs have been badly managed for some years. Most of the ground can be dredged to advantage.——The Reliance Dredging Co. is continuing operations in French gulch under the superintendency of M. McDonald. The water supply of French creek is holding out well and operations can be continued for two months longer.——The outlook for the lessees on the Country Boy is improving every day. The big body of high-grade zinc ore is continuing to open out in width, as it is followed in the winze. This is one of the largest bodies of zinc ore in the West.——The Wellington Mines Co. has now agreed upon the purchase of the Oro mine and the title to that old time producer will be transferred to this company about the end of September.——The assays from the new strike in the upper workings of the Wellington on the West lode, reported last week, gave returns of 1 oz. gold, with about 25% lead and 21% zinc per ton. The erection of the new mill will in all probability be started next month.——The Bay State Co.'s property is situated on North Star mountain, near Hoosier pass, and has lately come into prominence owing to the discovery of a vein of rich ore. Arthur C. Howard, the superintendent, has lately made some concentration tests on the ore and has produced a concentrate assaying $1,832 per ton. An adit is being run to cut this vein at a good depth.——Frisco camp, as well as Montezuma, is adding to the general activity of the county.——The Mary Verna and North American Mines companies resumed control of their properties and will in future conduct all operations themselves. Up to the present the large main development adits have been run on contract by the Southwestern Brokerage & Investment Co. which has now ceased this work. The large power plant at Curtin, which runs the air-compressor, drills, and electric light, passes into the hands of the two mining companies.——The cross-cut in the North American ground will cut at least eight known veins and the Mary Verna adit is headed to intersect four veins.——The Fisherman mine, at Montezuma, is opening up well, supplying ore for the Lenawa mill. It is capable of producing 100 tons per day, and will have no difficulty in keeping the mill fully supplied for some time.——The Clarion mine is being worked by Chas. Campbell and associates, who are taking out a large shipment of high-grade silver-lead ore.——The Orizaba mine is in bonanza, the pay-streak being now 3 to 6 ft. wide, all of shipping grade. The ore is rich in black sulphide of silver and also carries wire silver. Assays have given 100 to 500 oz. silver and $4 to $12 gold per ton, in addition to 20 to 60% lead and 10 to 20% zinc. Shipping will be commenced as soon as the ore-bins are completed and the wagon-road made to the mine.

Breckenridge, September 20.

IDAHO.

BLAINE COUNTY.

Fine-grinding mills and more tables are to be added to the new mill of the Dollarhide Co., at Carrietown, near Hailey. There are 6,000 tons of tailing to be treated. C. C. Ruthrauf has charge.

MONTANA.

MISSOULA COUNTY.

The Monitor mine, near Saltese, has this month shipped 100 tons of copper ore to the Tacoma smelter. The ores are said to net $59.50 per ton and average 20% copper. A shaft being sunk from the 300-ft. level is down 340 ft. All the ore thus far taken out has come from the 200 and 300-ft. levels during the course of development. The company has 15 men at work.

NEVADA.

ESMERALDA COUNTY.

The new town of Blair at the mines of the Pittsburg Silver Peak Gold Mining Co. threatens to eclipse the old mining camp of Silver Peak, as it is the terminus of the railroad being built from the main line of the Tonopah & Goldfield railroad. On June 1, this year, the preliminary surveys for the line were begun and on the first day of October trains are expected to be running over the 17½ miles of line. Grading for the 100-stamp mill has been started, and the mill will be completed within the next six or eight months. An aerial tramway is being constructed so that the ore may be carried direct to the mill with but one handling of the ore. Two 10-drill compressors are being put in at the mine.

W. H. Fenn of the Evans & Fenn lease on the Palmetto and Death Valley Co.'s ground at Palmetto has returned to Goldfield, as the Walters, Franks-Nesbitt, and Evans-Fenn leases have been consolidated and John Franks has been made superintendent. The consolidated firms have begun work on the Franks-Nesbitt lease, where there is a shaft 150 ft. in which there is good ore. The company is to treat its own ore, having secured the old mill for that purpose. As now arranged, with many improvements, the mill will be able to handle the ore.——A new 20-stamp mill at Pigeon Springs is being constructed by the Buster Mining Co. It is understood that the mill will treat custom ore while not at work on the company's products. When it starts and demonstrates that it will save the values, other properties in the vicinity will begin operations and have their ores treated at this mill.

The richest carload of ore in bulk ever sent out of the Goldfield district was settled for on September 17. It was purchased by the Nevada-Goldfield Reduction Works, and

came from the Frances Mohawk lease on the Mohawk. The car weighed 175 lb. more than 36 tons and ran $22,861. The net return was $20,943. The average was $688 per ton. The ore was shipped in bulk to the mill in a coal car to divert suspicion of its richness. Ore on this lease on the Mohawk was opened a month ago, and already the shipments have exceeded $225,000.

LINCOLN COUNTY.

(Special Correspondence).—Work on the Barnwell & Searchlight railroad is being rapidly pushed to completion. The power house of the Searchlight Light & Power Co. is completed; the town has been strung with wires and the machinery is on the road.——In the Colorado Mining & Milling Co.'s property, a 20-ft. vein has been cut at a depth of 70 ft., which averages $10 gold per ton. The shaft will be continued as originally planned to 200 ft. A gasoline hoist has replaced the whip.——The Parallel mine which adjoins the Cyrus Noble Extension on the north has ordered a large pump, and a mill will be installed before the first of the year. The Searlight Mining & Milling Co. is installing a 70-h.p. steam-hoist, using oil as fuel.——William Usrey, Edwin Beal and Charles Elgin Erdonda, of Los Angeles, have been examining the San Pedro group in which they are interested. The shaft is down 32 ft. in good ore. Their intention is to sink another 100 ft.——L. E. Bamberger, of the Bamberger-De Lamar mine, was here last week and secured some property. He will shortly commence active operations.——In the Annette shaft an important change has occurred at a depth of 100 ft. What appears to be a cross-vein has been cut, effecting the general character of the ore.——The main shaft on the Nevada Searlight is now down 100 ft. It is the intention to sink for an additional level and cross-cut. There are four veins cropping and the work underway is on the most northerly. Where uncovered by the recent rains fine ore is exposed.——The Searchlight Con. Mining & Milling Co. will install a hoist and begin active operations. Ore has been exposed at the 100-ft. level.——The shaft of the Cyrus Noble Extension Co. is down 104 ft., the first 50 ft. having been timbered. A drift has been run from the bottom, 46 ft. north and cross-cut drift southeast for the same distance. A hoist will soon be installed. Ore is similar to that of the Cyrus Noble, the main shaft of which is only a few hundred feet to the south.

Searchlight, September 19.

The recent heavy rains which damaged railroads to the extent of several thousand dollars in Searchlight had the effect of exposing numerous croppings whose existence had hitherto not been known. It also stimulated prospecting, and during the past few days many outfits have gone out to find new veins in the clean-washed gulches. Directly in front of the hotel at Searchlight croppings were uncovered in the street which showed a fine body of quartz, heavily copper stained and carrying some galena. Further down the street another cropping was exposed, from which specimens of free gold were taken. Both these discoveries are within the limits of the Original Searchlight townsite.

LYON COUNTY.

B. B. Hennessy and C. J. Durbrow, who have a lease and bond on the Emerson galena property in Red Canyon, 26 miles from Wabuska, have men driving an adit. The ore that has been taken from near the surface carries lead, silver, and gold. As soon as a road can be built to haul the ore to Wabuska, shipping will be started.

NYE COUNTY.

(Special Correspondence).—Johnnie is having a boom. Real estate has shown remarkable activity. The townsite was sold by the Johnnie Con. Gold Mining Co. to some Los Angeles capitalists for $50,000, and they have since then sold a number of lots at high prices. The mines throughout the district are showing remarkable improvement. Operations have been resumed in the Johnnie Consolidated and men have been at work on the 700-ft. level to cut the vein. The drifts both north and south on both the 500 and 600-ft. levels are in good milling ore, with occasional rich stuff.——The Globe-Johnnie has made a most remarkable showing. In the bonanza shaft a lode was exposed that gave sensational assays and it was the intention of the superintendent to tap this rich lode by shallow adits. The first of these is now advanced about 18 ft.; ore 3½ ft. wide has been found and samples taken clean across the face in several places assay between $700 and $800 per ton. On the Bullfrog-Johnnie a double compartment shaft was started that will be sunk two or three hundred feet on a body of ore that has been proved to be 200 ft. long and from three to five feet wide. One portion of this vein assays $126 for three feet wide, but assays from the whole body runs between $30 and $65. To the south of this orebody is a shaft 50 ft. deep in ore assaying between $6 and $12. Besides this there are two 50-ft. shafts connected by a drift 175 ft. long, disclosing an orebody four and a half feet wide assaying between $8 and $42. On the Bullfrog there are three parallel veins. Between these three there are a number of small stringers which are rich.——On the Leadville-Johnnie a shaft is being sunk, from which ore is being sacked that is almost solid galena, assaying 70% lead, 20 oz. silver and $4 in gold.——Work will soon be started on the Pittsburgh-Johnnie, which is surrounded by the Bullfrog, the Globe, and the Johnnie Consolidated.

Tonopah, September 24.

SOUTH DAKOTA.

LAWRENCE COUNTY.

(Special Correspondence).—The Golden West mine, on Castle creek, seven miles southwest of Rochford, is running full force, and it is said by E. J. Kennedy, the manager, who has brought the proposition to its present successful stage, that mining and milling are being accomplished for 50c. per ton. It is thought that the main fissure vein has been discovered. It stands nearly vertical and was found capped by a flat diorite intrusion to the depth of six or eight feet. The large orebody in the open-cut is now exposed 40 ft. wide and no walls in sight. This rather remarkable ore deposit was described and illustrated in the MINING AND SCIENTIFIC PRESS in the early part of October, 1905.——At the Standby, at Rochford, 20 men are employed blocking out ore and preparing for an extended winter campaign. New battery-blocks are being placed under the mortars of the 60-stamp mill. J. B. Baker is superintendent.——At the Montezuma, two miles north of Rochford, a five-stamp sampling mill is running, testing ore from all parts of the mine. There is more activity in mining now about Rochford than in many years past.

Rochford, September 18.

WASHINGTON.

CHELAN COUNTY.

The Chelan Electric Co. has filed a petition asking for the condemnation and the determining of the compensation to be paid for riparian rights on Chelan river and lands which will be overflowed in developing the water power of the Chelan river. Agents of the electric company have been busy for the past two months buying property and were successful in coming to terms with nearly all of the owners. The acquisition of the rights demanded in the present suit would give them all the power in the river, estimated at 120,000 h.p. If this plant should be put in, it will aid mining near Lake Chelan.

BRITISH COLUMBIA.

YUKON TERRITORY.

Word has been received from the Klondike mines railway that the owners in England are to extend the line next season from Sulphur Springs to Granville on lower Dominion creek, and perhaps as far as Flat creek. Surveyors have been instructed to locate a permanent route this fall, so that work of grading can start early next spring. A preliminary route has been selected to Flat creek. The line will be operating to Sulphur Springs, on the highest ridge of the Klondike camp, two weeks hence. The Government is building a system of fine wagon-roads, radiating to Heads, Gold Bottom, Hunker, Quartz and Sulphur creeks. The extension next year will follow down Caribou gulch, thence down Dominion creek to opposite the mouth of Gold Run. It is believed that the English backers contemplate extending this road up the ancient beds of the Stewart and Pelly rivers, across the Rockies to connect with the transcontinental railway from Edmonton to Dawson.

Personal.

W. H. WEED is at Salt Lake City.

H. DEC. RICHARDS is at Los Angeles.

F. LYNWOOD GARRISON is at Denver.

F. L. BOSQUI is at Lead City, South Dakota.

THEO. F. VAN WAGENEN is at Zacatecas, Mexico.

WILLIAM DEL. BENEDICT has returned to New York.

W. L. HARDY, of Inde, in Chihuahua, is visiting El Paso.

C. A. MOLSON is at Ogilby, San Diego county, California.

M. A. WOLFF has returned to England from Wei-hai-wei, China.

E. A. H. TAYS is examining mines in the Nacosari district, Mexico.

HENRY BRATNOBER has returned to San Francisco from Nome, Alaska.

CHARLES E. BUNKER is visiting the City of Mexico on mining business.

J. W. PALMER, president of the Shannon Copper Co., is at Clifton, Arizona.

F. C. BOWMAN is engaged as constructing engineer at Telluride, Colorado.

KARL EILERS will make New York his headquarters instead of Salt Lake.

FREDERICK BURBIDGE is general manager for the Frisco Mining Co., at Gem, Idaho.

A. E. MAY is the new manager of the Guadalupe mine, at Inde, in Chihuahua, Mexico.

EDMUND SPARGO has returned to Liverpool from the examination of mines in Norway.

FREDERICK GRUNDY, of Los Angeles, is examining mines in Kern county, California.

H. H. CLAUDET is visiting Denver and Nacozari (Mexico) in the interest of oil concentration.

THOS. H. LEGGETT has returned to London from Siberia. He will visit California in November.

GEORGE WILLIAMS has resigned as superintendent of the smelter of the B. C. Copper Company.

G. W. CAMPION is returning to Western Australia, as mining engineer to the Red Hill mines.

F. WALLACE WHITE has left Cleveland to investigate claims in Searchlight district of Nevada.

C. W. PURINGTON is examining mining property in southeastern Idaho and notheastern Utah.

W. H. STORMS has been appointed superintendent of the Yellow Aster mine, at Randsburg, California.

DAVID H. LAWRANCE, of Denver, is at Silver City, New Mexico, making some important mine examinations.

R. B. NICKERSON has accepted an appointment as superintendent of the Laurentian mine in Ontario, Canada.

GEORGE H. EVANS is at Mexico City. He will examine several mines in the Republic before returning to San Francisco.

S. F. EMMONS is in the American hospital at Mexico City, having been taken with malaria while attending the International Geological Congress.

AMONG American geologists who attended the International Geological Congress at Mexico were: F. D. Adams, H. F. Bain, F. Basom, G. F. Becker, S. Calvin, H. D. McCaskey, T. C. Chamberlin, H. F. Cleland, A. P. Coleman, H. P. Cushing, N. H. Darton, W. M. Davis, E. T. Dumble, S. F. Emmons, H. L. Fairchild, C. W. Hayes, A. Heilprin, E. O. Hovey, J. F. Kemp, C. R. Keyes, H. B. Kummel, A. C. Lawson, C. K. Leith, W. Lindgren, A. P. Low, Marsden Manson, A. M. Miller, W. G. Miller, F. L. Ransome, H. F. Reid, J. W. Richards, H. Ries, R. Ruedemann, C. H. Schuchert, E. C. Shepard, G. O. Smith, W. H. Weed, Olof Wenstrom, J. E. Wolff, and J. B. Woodward.

Books Received.

SYMMETRICAL MASONRY ARCHES, by Malverd A. Howe. This octavo volume of 170 pages, well illustrated, presents in a simple form the method to be employed in the designing of masonry arches according to the elastic theory. It is published by John Wiley & Sons, New York, and is for sale by the MINING AND SCIENTIFIC PRESS, the price being $2.50, postpaid.

MINERAL LAND SURVEYING, by James Underhill. A technical treatise on the surveying and patenting of mineral land, designed for the use of deputy mineral surveyors and students of mining engineering. It is a practical handbook prepared by an experienced surveyor well known in Colorado, and ought to prove of great service to those engaged in this branch of engineering. It is published by the *Mining Reporter*, at Denver, and is for sale by the MINING AND SCIENTIFIC PRESS; price $3, postpaid.

PORTLAND CEMENT is the title of the newest book on this important and increasingly interesting subject. The use of hydraulic cement is increasing largely every year, and any treatise which gives the latest information on the subject is welcome. This book, by Richard K. Meade, is a second edition, which shows clearly that it is a work in demand by practical men. It treats of the raw materials employed in cement making, its manufacture, analysis, tests, and uses. Sent by the MINING AND SCIENTIFIC PRESS upon receipt of price, $3.50. The Chemical Publishing Co., publishers, Easton, Pennsylvania.

CURB QUOTATIONS — NEW YORK.

	Closing Prices. Sept. 20.	Sept. 27.
Bingham Central	1¾	2¾
Boston Copper	31⅝	32½
Calumet & Arizona	16½	16¼
Cumberland Ely	10⅜	10½
Dolores	8½	8⅝
El Rayo	6¾	7
Guanajuato Con.	5⅜	4⅞
Giroux Con.	7	10⅜
Greene Con.	27⅞	26⅜
Nevada Con.	20	19⅛
Nipissing	18⅛	20⅛
Tennessee Copper	44	43¾
Tonopah Ex.	5⅝	5⅝
Tonopah-Belmont	5.62	5⅝
Tonopah	18¾	18¾
United Copper	66¼	66½
Utah Copper	32¼	27¾

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

ANGLO-AMERICAN SHARES.

Cabled from London.

	Sept. 20. £	s	d	Sept. 27. £	s	d
Camp Bird	1	6	3	1	6	6
El Oro	1	8	3	1	8	9
Esperanza	3	5	0	3	8	0
Dolores	1	13	9	1	15	0
Oroville Dredging	0	19	0	0	19	9
Stratton's Independence	0	4	0	0	4	0
Tomboy	1	8	3	1	8	9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, September 26.

Con. Virginia	$0.84	Manhattan Con	$0.85
Ophir	2.55	Jumping Jack	0.58
Savage	1.15	Midway	2.17
Tonopah Ex	5.75	Montana	2.92
Belmont	5.65	Mohawk	4.35
Jim Butler	1.35	Silver Pick	0.74
Jumbo	1.40	Sandstorm	0.73

METAL PRICES.

By wire from New York.

	Closing Prices September 20.	Closing Prices September 27.
Copper—Lake (cents per lb)	19.71	19.55@19.80
" Electrolytic "	18.38	19⅛@19.40
" Casting "	18⅛	19 @19¼
Lead "	5.75	5.75
Spelter "	6.03	6.35
Silver (cents per oz.)	66.949	68⅜

THE CALIFORNIA DEBRIS COMMISSION HAVING received applications to mine by hydraulic process from Nelson Contracting Company, in Calaveritas Hill Mine, near Calaveritas, Calaveras County, California, draining into O'Neill's Creek; and from Wm. McGuire, in Camden Mine, near Nevada City, Nevada County, California, draining into Greenhorn Creek, gives notice that a meeting to receive any protests will be held at No. 1733 Pine St., San Francisco, Cal., October 15, 1906, at 1:30 P. M.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling and smelting.

MANY tailing piles would contain less value if the mill practice were carried on with more care.

THIRTY new postoffices have been established in Nevada since the first of the year, all of them in mining camps.

CRUDE petroleum makes a satisfactory rope grease for either standing or running ropes on the surface or underground.

IT IS SAID oil-burning locomotives on the Southern Pacific railroad consume three barrels of oil to accomplish what they did formerly with one ton of coal.

LARGE quantities of ore are stored at the various working mines at Cobalt, Ontario, awaiting the time when the Canadian smelters are ready to receive it.

LIMESTONE screenings are superior to sand as a concrete aggregate. Screenings that will pass a 4-mesh sieve, but not finer than an 8-mesh, are the most valuable for the purpose.

THE starting rheostat is placed in series with line and field, and it is immaterial whether it is in the positive or negative lead. Necessarily, the point of satisfactory commutation depends upon the load.

A SERVICEABLE and inexpensive flexible shaft for use in connection with electric motors and similiar devices, may be made from what is known as 'tiller rope', a special make of steel wire-rope.

DOLOMITIC LIMESTONE is preferable to plain calcium carbonate as a flux, as it increases the fluidity and fusibility of the slag, while at the same time removing the sulphur as fully and efficaciously as limestone.

PORTLAND CEMENT concrete suffers no harm by freezing after the mass has fully set; its hardening is interrupted, but proceeds again without hindrance after thawing. Damage is to be feared from frost before setting, especially if an excess of water be used.

THE intrusion of dikes does not always result in pronounced metamorphism. Much depends on the character of the rock intruded by the dike. Quartzite is often little effected, while limestone is often completely changed to garnet, chert, or other minerals wholly unlike the original.

IN the operation of mines the mining engineer must learn to discriminate between veins formed by the infiltration of minerals and those which are merely the results of mechanical movement of the rocks—'crossheads.' The difference between these is not always apparent on casual inspection.

ALL students of ore deposition agree that many ore deposits derive their metalliferous content, in part, from igneous rocks and in part from sedimentary rocks, but to give any estimate of the relative amounts of metalliferous materials derived from the original igneous rocks and from the secondary rocks is impossible.

HOW MANY MINERALS may be added to steel to its advantage is not known, but among those most commonly employed are manganese, chromium, carbon, aluminum, molybdenum, tungsten, vanadium, and nickel. The effect of these several minerals is to harden and toughen steel. They also have a beneficial effect upon cast iron, but in a less degree than upon steel.

FOR years European specialists, notably Germans, gave much attention to concentration of ores, and although they accomplished wonderful results, as compared with the then rough-and-ready practices of Western America, the time has now come when the best American practice is superior to that of any part of Europe, for now classification, sizing, and concentration are carried to an extreme of refinement not hitherto attempted, or at least successfully accomplished elsewhere. The processes are automatic, mechanically successful, and profitable.

NO mineral is more frequently mistaken for valuable ore than garnet. Its comparatively low specific gravity, 3.15 to 4.3, should serve to distinguish it from the mineral for which it is most frequently mistaken—cassiterite, specific gravity 6.8 to 7.1, nearly twice as heavy as garnet. It is also often mistaken for zinc-blende, which some of the brown varieties resemble. The specific gravity of garnet and zinc-blende is nearly the same, that of blende being 3.9 to 4.1. A drop of hydrochloric acid on blende immediately evolves sulphuretted hydrogen, whereas it has no effect on garnet. The mineral occurs in many colors and shades including colorless to white, pale pea-green, amber-colored and honey-yellow, wine-yellow, brownish-yellow, cinnamon brown, rose, red, violet, emerald-green and black.

AT Wolfram camp, Queensland, Australia, the wolfram-bearing quartz lodes traverse granite rocks, and carry quantities of molybdenite and bismuth. There most of the mines have, since they were first opened, been held by working miners whose sole object seems to have been to pick out wolfram wherever visible, but the awkwardness of this system of mining is felt as depth increases, and a diminution in the yield becomes apparent. Late advices give the price of ore containing 70% tungstic acid as £84, and the advance has proved an incentive to the miner, but it is probable that the mines at Wolfram camp will ultimately be merged in one or two combinations, with capital sufficient to work them in a systematic and economical manner. Tons of fine molybdenite await a simple and payable process of separation from the broken quartz with which the mineral is mixed.

SHOOTING STARS are distributed through space uniformly as to number and direction of motion. If the earth were at rest they would be observed uniformly as to number and direction of motion from every point of the globe. Owing to the annual motion of the earth around the sun, the greatest number of shooting stars are encountered by observers on the hemisphere directed to the point in the sky toward which the earth is traveling at the instant. The point is called the apex of the earth's motion and is always on the ecliptic about 90° west of the sun. Consequently throughout the year the apex is on the meridian at about 6 a. m. (upper culmination), and at about 6 p. m. (lower culmination). Therefore the greatest number of meteors should be seen to fall in the early morning before daylight, the least number in the evening after sunset. These conclusions are in strict accordance with observation. During its apparent motion from lower to upper culmination from 6 p. m. to 6 a. m., the apex is in the eastern hemisphere and on that account an observer will note the greatest number of shooting stars as coming from the east and neighboring parts of the sky, and the least number are coming from the west.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Unrest in Mexico.

The Editor:

Sir—Under the above caption, 'A Gringo' discusses the wild rumors of war, revolution, and general annihilation of all Americans in Mexico, in the issue of the MINING AND SCIENTIFIC PRESS for August 11; and the Editor further discusses it, in a very sane and common-sense manner in the issue for August 18. As there is more or less error in both, and as the daily press on the United States side of the Border has let its imagination run wild, and as the ides of September has passed and Mexico has not annexed the United States, I beg permission to say a few words, based on 20 years' residence in Mexico, and an intimate association with its people.

Did the troubles in Colorado a year or two ago lead anyone to believe that a revolution was threatening in the United States? When mobs murdered Italians in New Orleans several years ago, did anyone fear that all Italians were to be murdered in the United States? Someone will speak up and say that those outbreaks happened in the United States, an enlightened country. True; nevertheless hardly a month passes that the papers do not chronicle a lynching or a burning of someone by a mob in that same enlightened country, in defiance of all law, the authorities, and humanity. Let me say right here: Such a thing could not happen in *uncivilized* Mexico, without the perpetrators feeling the heavy hand of the law. Before I can be misunderstood, let me say, I am an American to the marrow; but years spent in other countries have broadened my view, I hope, though making me more an American.

The troubles at Cananea were only local, and though bad, cannot be compared with many riots that could be named, that have happened in the United States during the last ten years. That it led to bloodshed was the fault of the Americans themselves. A little tact, a little patience, with a kind firmness, would have prevented it; and the wonder is that under the circumstances and provocation it was not worse.

The papers in the United States, especially along the Border, have been harping on the uprising in Mexico for the past three months, setting the date for September 16. And, on the American side, the comment has been continuous and wilder every day. How is it on the Mexican side? Except among the Americans, one rarely hears the subject mentioned; and when the natives take it up, it is with surprise and in a spirit of ridicule. Among the masses, 200 miles south of the Border, the subject is almost unknown. The American press has harped and speculated on the subject so much that once in a while one sees an article in some of the second-rate Mexican papers discussing the matter, and the whole animus seems to be the fear that Americans are trying to start trouble that will lead to the absorption of their country by force. This is the feeling among the middle class. The educated class looks on the matter as a joke, and if there is an inner opinion, it is one of contempt; for the tone of many of the American comments would lead them to believe that the American people really feared Mexico.

'A Gringo' says, the press reports have been strangely accurate. I should say, the contrary had been the case. We must remember that Mexico, under General Diaz, has been *forced* to enjoy peace for 30 years now, and it would be almost impossible for any revolutionist to get a following. The business man is against it, because it jeopardizes his interests. The *peon* is against it, because he is the man behind the gun, and would be forced to fall in behind either revolutionist or Government, whichever he had the ill luck to encounter. There is, at present, no known leader who would care to undertake the job, and the *people* are satisfied to let well enough alone. The *peon* is unorganized, by reason of his manner of living, and could not sustain a three days' strike. Where ill paid, he has no surplus; and where well paid he has less (to use a bull). Where well paid, the *peon*, instead of bettering his condition and spending the extra on his family (as saving is beyond his comprehension, he firmly believing it would be doubting Providence to look out for tomorrow), spends it viciously; and, besides spending his earnings, he plays his credit to the limit; hence, he is always in debt. He strikes, and where is he? He must eat, but, being out of employment, he has no salary and his credit stops. He must eat, so the second or third day sees him back at work, whether his grievance has been settled satisfactorily or not.

The educated class is becoming the governing class; the middle class is, as a rule, fairly well-to-do and contented; the *peon*, because of his general irresponsibility, is obliged to work, which keeps him out of mischief. Here you have the actual conditions. Where can you locate the revolutionary element?

Now, as to anti-foreign feeling: There is some jealousy, it is true; that is only natural; but it is not serious. Jealousy is a common human affliction. That there is any serious feeling against Americans, I doubt. The educated classes are intelligent enough to recognize the fact that their country can never be developed without foreign capital, and they, as a rule, welcome it. The middle classes are, by nature, open-hearted, hospitable, and charitable, in all its senses, and are glad to see respectable Americans come into their country. The *peon*, as a class, is the truest friend the foreigner has, and he recognizes the great advantage the coming of the American is to him; although at times he may not show due appreciation, nevertheless he is glad to have the American come; and, where treated kindly and firmly, he makes a good and loyal workman. The *peon* is simple and childlike, and is easily led, be it for good or bad, and the wise man will take advantage of this fact.

Two hundred miles south of the Border, and then only in the State of Sonora, the anti-foreign feeling is unknown, in a collective sense. Along the Border, where the common American (and as a rule he is very common) has mixed with the *peon* class of Mexican, the *peon* has a contempt for the *gringo*, and usually with good cause, and there *is* more or less animosity. Here, also, you have a worthless, familiar workman who sizes up all Americans as alike, and to be 'done up.' But for this condition, the American alone is responsible. Although there may be local animosities brought about by unwise management, or the over-bearing manner of a few American workmen in Mexico—and often by such bearing from men from whom you would expect better—it can be said confidently that there is no general ill-feeling against Americans in Mexico; and where the American is a gentleman and does not leave his common decency behind him when he crosses the Border, he and his family will be as safe in any out-of-the-way camp in Mexico as they would be in any camp in the United States. There may be some isolated and individual dissatisfaction in Mexico, but that celebrated uprising is a myth, concocted by the American press, and has no real foundation. The courteous, honest, decent, and judicious American is welcome in Mexico, and is as safe as at home; and I speak from a personal, social, and business experience of over twenty years.

E. A. H. TAYS.

Fuerte, Sinaloa, September 16.

Contraction of Furnaces.

The Editor:

Sir—I note in your issue of August 11 a short item as to causes of cracks in reverberatory furnaces. A few years ago when the use of the open hearth, or Siemens regenerative, furnace was not in such general use in steel mills as it is now, much trouble was experienced from the roof falling after a comparatively few heats. This was no doubt caused in many cases by faulty design or materials not the best for the purpose, but one steel-works manager of my acquaintance thought he saw another factor in the trouble.

These furnaces were operated on producer gas, and the flow of this gas was supposed to be reversed in direction through the furnace at certain intervals in the regular process of working. During the working days of the week this would be attended to with regularity, but when the mill was shut down from Saturday night till Monday morning, it was a matter of faith on the part of the superintendent and faithfulness on the part of the furnace tender, which latter seemed sometimes to be found lacking, for it was no uncommon thing on a Monday morning, for the melters to find a cold furnace—that is 'cold' from the melter's standpoint—and the superintendent put a check on this by installing a watchman's time-detector system on the furnaces so that every time the valves were reversed, the time of such reversal was registered in the office.

The result was that 'cold' furnaces soon became unknown in that mill, and whether due to this fact I will not pretend to say, but this mill became famous in open-hearth steel circles for the length of time it was able to run its furnaces without repair of roofs, and the superintendent of the mill was disposed to ascribe much of his success with his furnaces to the fact that he had eliminated from the working conditions the wide range of temperatures the furnaces had before been frequently subject to.

It is hardly likely that this remedy would be practicable on many classes of furnaces, but there is little doubt that many times more attention could be given than is to the matter of keeping furnace brickwork at a fairly constant temperature, once it is heated up, and not let it go to pieces from alternate expansion and contraction, which is one of the most troublesome factors in the wear and tear problem.

X.

New York, September 1.

Who Is a Mining Engineer?

The Editor:

Sir—The rains are heavy in these Sierra Madres at this season of the year and the mails are frequently delayed in consequence, so your issue of August 4 is only just to hand, with its letter from 'Viator' of London and your resulting editorial, the latter under the caption of 'Who Is a Mining Engineer?' 'Viator's' letter is of interest to all having the welfare of the profession at heart, to me no less than to others, and his point is well taken, but it is the breadth of the spirit shown in your editorial that appeals most to me, who have been through the mill, from mucker at eighteen to superintendent at twenty-eight, and the purpose of this letter is to thank you for it.

While bearing the responsibilities of both married and professional life, I still class myself among those "young fellows of the profession" to whom, in the past and in different surroundings, you have often proffered a word of encouragement. I practice the combination of the mining and engineering professions, granting myself the plain title of 'Engineer,' for want of a better one bestowed on me by a college and because I have been an engineer in embryo all my life, the attainment of that end having been instilled in my mind by my mother, to whom I owe much of my success, from the time I took my first lessons in walking and talking. I have "had charge of mines, surveyed them, sampled them, and advised clients in the purchase of them," but beyond all that, I have shoved the tram-car underground, have hammered the drill at the face and in the stope, framed the sets for shafts and adits and have had my eyebrows singed by the heat from the assay furnace; further still, I have read and experimented, have been assisted over the hilly places by a partial technical education, obtained at my own expense through force of circumstances, and yet I cannot exhibit a sheepskin bearing my name and a quantity of Latin, all certifying to the fact that I have earned the title of 'Engineer of Mines,' a title granted by the particular technical institution which I had the good fortune to attend for a short time. It has all been an up-hill fight and, now that I am on top, so to speak, it is considerable satisfaction to have you, from whose writings I have learned many a valuable lesson, confirm my personal belief to the effect that I am entitled to subscribe myself an engineer.

I have in my library a book entitled 'The Sampling and Estimation of Ore in a Mine,' the preface of which ends with the expressed opinion of the author that "there is no improvidence so pitiful as the waste of experience." I have made of those words a maxim and embellished them on my wall.

AMERICANO.

Chihuahua, Mexico, August 28.

The Position of Amalgamating Plates in the Stamp-Mill.

The Editor:

Sir—The ordinary position of the amalgamated copper plates in a stamp-mill directly in front of the stamps is one which seems natural enough, but it is accompanied by a number of disadvantages.

The object of this letter is to draw attention to the advisability, in nearly all cases, of placing the plates in a room or building quite separated from that containing the stamps or other crushing machinery. Among the advantages connected with this procedure are the following:

1. The absence of noise and vibration caused by the stamps.

2. Much better lighting during daylight hours can be provided.

3. Increased space for working about the stamps, making repairs, etc.

4. Increased space also about the tables, which can be placed as far apart as desired, and built at a convenient height above the floor of the plate room.

5. Better arrangements can be made for altering the grade of the tables, etc.

6. It is easy to arrange a system of pulp distribution, so that the supply of pulp can be shut off any one table, and be distributed equally between the others, or as many of them as may be wished. This obviates the necessity of having to hang up stamps when dressing the plates or collecting amalgam. The ordinary plan of avoiding this by diverting all the pulp on one plate to a single adjoining plate is also obviously bad practice.

7. In consequence, there is no need for the amalgamator to hurry over his work. He can take his time, and do his work thoroughly.

8. By having the doors and windows of the plate room properly secured, casual pilfering by dishonest employees can be prevented, and the risk of robbery by outsiders reduced.

9. It becomes a simple matter to classify the pulp if

desired, before passing it over the plates, and to vary the mode of treatment for each class.

I do not think that there is anything to be said against the separate plate room, except the slight initial cost, the need in some cases of an elevator to give the fall required for the launder conveying the pulp from the stamp shed to the plate room, and the fact that in small mills where only one attendant is employed to look after the stamps and plates, the latter would be less constantly under the eye of the attendant. Even then the advantages in most cases would outweigh the drawbacks.

The benefits to be derived from the separate plate room are such that it should be generally adopted in all new mills. In the majority of mills of old design the change to separate plate room might be advantageously made. I may add that the system here advocated was adopted by the Waihi company some years ago, and, it is almost needless to say, with entire success.

PERCY MORGAN.

Wellington, New Zealand, August 14.

Black Sand.

The Editor:

Sir—In your issue of September 1, I note your remarks on the extravagant expectations created in some minds by reports on the investigations made by Dr. David T. Day into the values of the black sand, generally present in all gold-bearing gravels.

Dr. Day took up the same subject on behalf of the United States Geological Survey about nine years ago, and a partial summary of his report thereon appeared later in Professor Kemp's valuable monograph on the platinum metals. I do not know of any full report on the work in the same line done by Dr. Day at the late Portland Exposition, but as far as known, great results have been promised the mining industry from the laboratory work then performed for the Geological Survey.

So far nearly all the work done under Dr. Day's supervision in relation to the black sand was anticipated many years ago by the writer, being given to the public through the pages of the MINING AND SCIENTIFIC PRESS during October and November, 1894. In those articles the occurrence, distribution, composition, and relative values of the gold-bearing black sand of California were fully discussed, and some practical hints given for their economic working and the extraction of their—often high—gold values.

The impracticability of devising an economically successful use of the iron minerals of these sands had long before that time been demonstrated, and in view of later developments in the iron industry of the United States, any promise of profitable use of these sands, for the production of iron or steel, may be said to be utterly chimerical.

J. A. EDMAN.

Berkeley, Cal., September 9.

The valuable articles mentioned in the above communication did indeed treat the subject in an excellent way. We believe the matter has been overdone—like titaniferous iron ore and gold in sea-water. In regard to our criticism of the exaggerated writing resulting from Dr. Day's well-meant efforts, we quote the following:

"There may be a rich gold mine in your back yard, if you happen to be living on the site of an ancient lake. In scores of places, scattered all over the country, there are pits and mounds of black sand, out of which gold, platinum, and other precious minerals may be extracted. The National Government, itself, is the promoter of this latest mining sensation, which promises to make as many over-night gold-kings as the discovery of Alaska itself."

While the writer responsible for this stuff is prone to yellow journalism, *The Technical World Magazine*, in which it appears, is a responsible periodical and a widely read publication. Black sand has become—to technical men, at least—an absurdity.—Editor.

Secondary Enrichment.

The Editor:

Sir—The article in your issue of August 11 by Mr. Courtenay De Kalb on 'Secondary Enrichment Upward' describes a very interesting occurrence and I have read it with much interest. While I have no better explanation to offer for the phenomenon described, I would like to ask for further light on some points which are not clear to me.

I do not quite understand how the reactions necessary to form the resulting minerals are to take place at such proximity to the surface and its superabundant oxygen; I have never come across such an enrichment as Mr. De Kalb describes, but it is commonly known that in sulphide copper mines any drift or other opening left standing for a time, without active flow of water, will be covered with crystal of the sulphates of iron, copper, and, if it is present, zinc. This constitutes also a secondary enrichment *outward*, for in my experience at Bingham, in Utah, this action is shown not to be confined to the actual surface, but to affect the ore or walls of the opening for a depth of many inches, even though there are no sulphates visible. Mr. De Kalb describes his surface rocks as being so hard as to resist the absorption of water from the surface, and this would seem to me to indicate that this material would afford little room in its pores for the reactions necessary to be carried out, and little chance for the escape of the waste products after the reaction had been completed. Under the conditions described one would naturally look for the re-concentration of the copper in the cleavage of the rocks, or (as is often the case in Butte) as a complete substitution of some one of the original rock-forming minerals, usually the mica.

Where such reactions as the article describes have taken place in the pores of an eruptive rock, it is unusual to find this rock unaffected by the solutions; some of its original constituents are usually affected, as above stated, thus making room for the re-deposition of the minerals. The finding of voids in the quartz and in the diorite at greater depth is proof of this same action going on, and it suggests to me that possibly the slower action of the solutions at or near the present surface has tended to make a replacement and enrichment *downward*, gradually re-filling these voids, while the rocks, disintegrated by the chemical activity, have yielded to the weather or ice, till the same was removed; then in late geological time, that is, since the Glacial period, the reaction has ceased and the hardening of the surface has taken place by weathering or oxidation of the iron of the mineral.

I do not think that the depth of the development on the Grattan lode was such as actually to establish its permanent poverty; the appearance of pyrite ten feet above the bottom of the shaft, even if this mineral were totally barren, seems to me to give sufficient promise of re-appearance of copper with greater depth, and the mention of the permanent values in a neighboring mine seems to bear out this presumption.

The finding of the barren zone, with voids in place of pyrite, and then pyrite again, might indicate a previous fluctuating water-level and the chance of re-deposition at some depth below.

JAS. W. NEILL.

Pasadena, August 21.

MINERS not infrequently fail to recognize a valuable ore owing to unfamiliarity with other than common minerals.

Three Weeks in Mexico---V.

Cyanide Practice at El Oro.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The development of the milling practice at El Oro is full of interest. In 1873 a *hacienda de beneficio*, or reduction plant, was erected to crush ore and treat the accumulated tailing from a still older *arrastre*, and to this plant further addition was made in 1885. The mill then included 25 stamps with amalgamating tables. In 1890 the accumulation of tailing made by the stamps was sold to a man from Butte, named Albertson. The tailing he handled was richer than the ore being mined today. Nevertheless, the contract for the treatment of it was cancelled after the purchaser had installed four amalgamating pans with settlers and had started to ship bullion. This was under the regime of General Frisbie. In 1894 a Chilean mill was brought from Chicago, to grind the ore after it had passed through a Comet crusher. The Chilean mill did finer grinding than the stamps, which at that time were also preceded by crushers, of the Blake type. The mill in turn left a dump which, eventually, as methods improved, it became profitable to re-treat. Late in 1894, James B. Haggin bought control. In the following year the old mule-stable was converted into a cyanide annex. Redwood tanks with 4½-ft. staves and 24-ft. diameter were erected; the sump-tanks were larger, with 6-ft. staves. The tailing was carried, in boxes on the backs of *peones* and in hand-barrows, to the vats. Cyanide solution was first introduced by upward percolation through a false bottom, the succeeding water-washes being applied from above. This was followed by precipitation on zinc shaving, with acid treatment for the zinc 'shorts,' the bulk of the precipitate being carefully washed and melted forthwith. The bullion thus obtained was of extraordinary fineness—960 to 980—without the use of any nitre in the melting. This was one of the first successful cyanide plants in Mexico. With only the addition of the small cyanide plant just described, the mine paid $1,000,000 in dividends up to May, 1898, besides meeting the cost of various installations, including part of the 100-stamp mill taken over by the English company, which now controls the property.

The first 100-stamp mill was designed under the Haggin-Frisbie regime and was only expected to crush 1,500 tons per month through a 60-mesh screen. When the property was purchased by the Exploration Co. in 1898, this mill was too near completion to be altered. The slime-plant was added in 1900, after the present company had been formed. W. K. Betty had conducted a series of experiments for the new owners and double treatment was then adopted for the slime-plant; it was only making the best of conditions as they were found; hence the pile of stored tailing now about to be re-treated.

The general plan of treatment was as follows: From the stamp-battery the pulp passed over copper plates and was then divided, by spitzkasten, into 'coarse sand,' 'fine sand' and 'slime,' each product receiving individual treatment. The sand underwent double treatment, in South African style; it was first cyanided in collecting vats and then dropped into cars which removed it to the treatment vats. The slime was caught in a settling vat and thence went to the treatment house, where it was agitated by jets of compressed air. After treatment, the sand was dropped into cars underneath the vat, while the slime was flushed out with water in the ordinary manner.

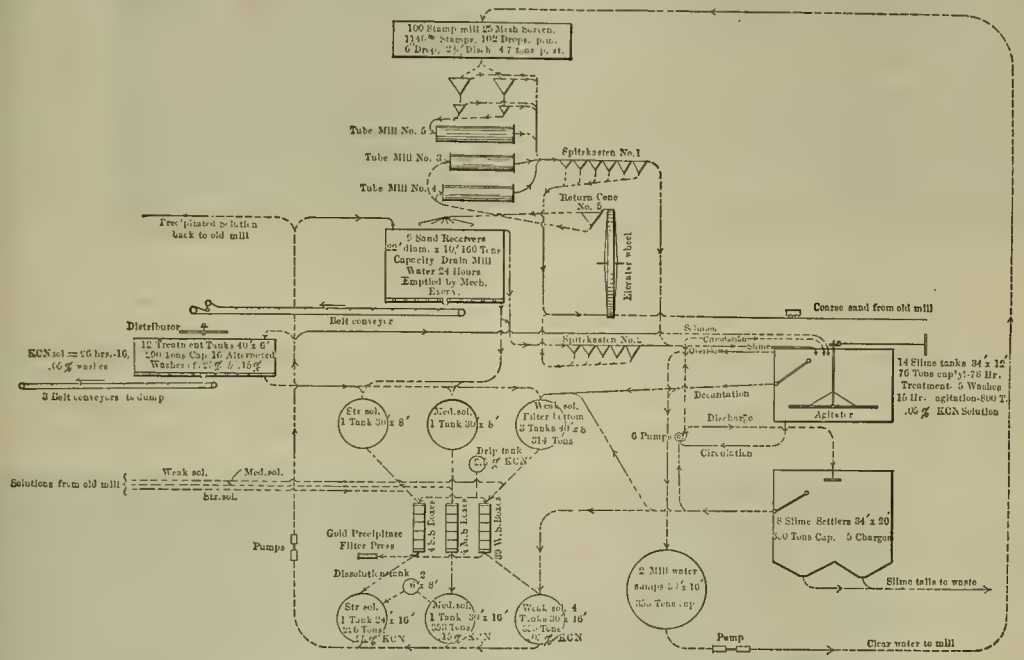


Fig. 1.—Diagram of Cyanide Treatment at Plant No. 2. (September, 1905.)

In the meanwhile the capacity of the mine grew, not only by reason of the discovery of new orebodies, but indirectly through the cheapening of operations, so that further enlargement of the mill became prudent. In 1905 another, and the last, addition to the reduction plant was made. The new mill of 100 stamps, with its up-to-date cyanide equipment, differs from the old one in five respects:

1. Mechanical handling of the ore.
2. Heavier stamps.
3. Re-grinding in tube-mills.
4. Mechanical handling of sand by distributors, excavators, and belts.
5. Mechanical agitation of slime by stirrers and centrifugal pumps.

The new mill contains 100 stamps, each weighing 1,180 lb., falling 102 times per minute, with a 6-in. drop. The

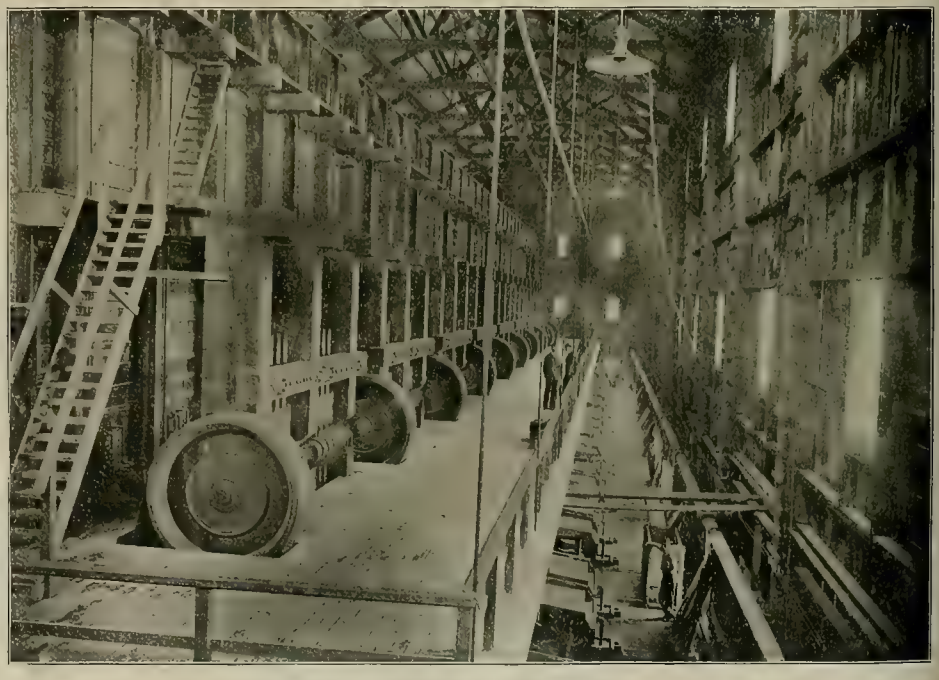
depth of discharge is 2½ to 3 in. with a new die, and 3½ in. when the die is worn out. Woven brass wire-screens of 35 mesh are used.

The accompanying diagram* (Fig. 1) illustrates the process. From the stamps the crushed ore goes to a system of cone-classifiers and spitzkasten which separate the coarsest sand and send it to the tube-mills for re-grinding. The fine sand from the stamps combines with the similar product from the tube-mills and is elevated by the raff-wheel to the sand-collecting vats. Any slime which may have escaped complete separation and accompanies the sand, overflows from these vats and passes to the slime-plant, joining with the rest of this product that has been eliminated from the sand by the classifiers. The sand is distributed by a revolving mechanism of the Butters & Mein type. There is no chemical treatment in the sand-receiver, the idea being to keep the mill-water free from cyanide while effecting a final separation of slime, so as to get a clean product. The water and slime are drawn off through gates or slots on the side of the vats; these gates are closed by a roll of canvas as the vats fill. The sand, when thus finally freed from the last trace of slime, is removed by a Blaisdell excavator which drops it through a central opening onto a Robins belt-conveyor. This Blaisdell excavator is like a revolving disc-harrow and it has proved a most efficient machine. It uses comparatively little power and works smoothly. The belt-conveyor takes the sand (containing now only from 10 to 11% moisture) to the treatment vat, which is fed by a revolving distributor operated by a variable-speed motor, the centrifugal force being so regulated as to throw the sand to the sides or centre of the vat, as required. The charge is 265 tons, dry weight. Ten washes of alternately medium (0.1%) and strong (0.2%)



Blaisdell Excavator in El Oro Cyanide Annex.

Between the vats there is a belt which conveys to the Blaisdell distributor, working on the same track as the excavator.



Interior of No. 2 Stamp-mill. El Oro.

*Borrowed by permission from 'The Grinding of Ore by Tube-Mills, and Cyaniding at El Oro, Mexico,' by G. Caetani and E. Burt. Trans. A. I. M. E., February, 1906. This is a conscientious and most valuable paper, giving a detailed account of the cyanide practice at El Oro.

solution are introduced, six hours apart. This treatment is followed by no less than thirty 'weak' washes, such a lengthy operation being specially designed to extract silver. These 'weak' washes are four to six hours apart and contain 0.03% KCy. Each wash is equal to 13 tons of solution. After treatment, the residue, again using the Blaisdell machine, which moves on rails, is discharged onto a conveyor that takes it to the dump. Here the distribution of tailing is regulated, as the accumulation grows, by a hinged belt-conveyor in two lengths, the last one being swung round according to the contour of the ground.

The slime goes to a collecting vat, from which the thick mud is drawn off at the bottom and thrown into one of the treatment vats. There are twelve of these, each 34 ft. diam. and 12 feet deep. Here it is agitated with a proper proportion of cyanide solution, which is introduced simultaneously. The apparatus for stirring consists of two long and two short arms made of oak bolted to a steel star. The oak arms are solid; they taper outward from a cross-section of 4 by 6 in. to 4 by 4 in. The thick end is bolted to the steel star, which is set on a vertical shaft. When the vat is charged, lead acetate is added immediately. Tests have shown that a beneficial result ensues forthwith, particularly as regards the dissolution of the silver.

Lead salts when added in excess to the cyanide solution, give a precipitate of basic lead cyanide, but when present in small proportion the lead remains in solution, presumably owing to the formation of an alkaline plumbite (K_2PbO_2) by reaction with the caustic alkali, thus:

$$PbAc_2 + 4KOH = K_2PbO_2 + 2KAc + 2H_2O$$

Mercuric chloride is sometimes employed for the same purpose, producing a reaction with the KCy so as to form a soluble double cyanide, thus:

$$HgCl_2 + 4KCy = K_2HgCy_4 + 2KCl.$$

The most useful effect of these soluble lead and mercury compounds is the removal in the form of insoluble HgS and PbS, of any soluble sulphides that would otherwise retard the solution of gold and silver, and which may even re-precipitate silver already dissolved:

$$K_2S + K_2HgCy_4 = HgS + 4KCy$$
$$K_2S + K_2PbO_2 + 2H_2O = PbS + 4KOH$$

The double mercuric-potassium cyanide also acts as a solvent, attacking gold more readily than simple KCy; and this action is independent of the presence of oxygen, gold replacing mercury:

$$K_2HgCy_4 + Au = K_2AuCy_4 + Hg$$

Silver is similarly dissolved. These reactions have been amply verified. The action of mercuric-potassium cyanide on gold is the basis of patents secured by Keith and Hood; the latter also claims the use of lead as facilitating the solvent effect of cyanide solutions. De Wilde has a patent involving addition of lead oxide to cyanide solution. These compounds also influence precipitation beneficially if they remain in the solution up to the point of entering the zinc-box, as in that case the lead and mercury are precipitated on the zinc, forming zinc-lead and zinc-mercury couples of high electro-motive force. In this precipitation the zinc simply changes places with the mercury or lead, as is also the case when zinc shaving is dipped in lead-acetate solution.

The charge is 60 tons (dry weight) of slime; this is mixed with a solution in the proportion of 2½ solution to 1 of slime, by weight. The solution contains 0.05% KCy*. Agitation continues for six hours. The vat is then filled until there is 3½ of solution to 1 of slime; this is well stirred and then allowed to settle. Settling and decantation consumes eight hours. This part of the process is hastened by the use of lime, which is added to the feed of the tube-mills.

The lime has two functions, one of them chemical, the other physical. By virtue of the first it neutralizes the sulphuric acid and decomposes the ferric sulphate contained in the ore, and due to oxidation. Such oxidation may have occurred in parts of the lode before it was mined, or it may have been developed by subsequent contact with the air in its passage to the mill or during treatment. The lime serves in this way to protect the cyanide of potassium or sodium, as the case may be. In slaking, the calcium oxide (CaO) takes up water to form the hydroxide –$Ca(OH)_2$–, which dissolves in water to the extent of one part in 800. Lime is preferable to caustic soda, for this particular purpose, because the calcium carbonate is insoluble in water, while the sulphate is but slightly soluble, so that they do not accumulate in the cyanide solution, as is the case with the corresponding sodium salts where NaOH is used as the neutralizing agent. Soluble carbonates are also precipitated by it, leaving caustic alkali in solution, thus:

$$CO_3 + Ca(OH)_2 = CaCO_3 + H_2O$$
$$Na_2CO_3 + Ca(OH)_2 = CaCo_3 + 2NaOH.$$

By reason of its physical function in the mill, lime coagulates slime, so as to cause settling of the particles. The effect is complex. Much of the material classed as slime is of a colloid nature — indeed slime has been recently labeled a 'colloid hydrate.' Such matter when brought into contact with pure water becomes almost gelatinous, and therefore impervious to solution. There are several substances, notably alum, acids, soap, and lime, which, when added to the turbid water, cause the gelatinous matter to coagulate or flocculate, so as to produce a separation into distinct agglomerations. Further, minute particles of ore, whether slimy or not, if suspended in water and refusing to settle, develop a tendency to subside when lime, alum, and other substances are introduced. Although imperfectly understood, these reactions are used largely both in metallurgy and in agriculture.

The slime settles rapidly; within two minutes there is an inch of clear water. This clear solution is decanted and passes to the filter-vat the bottom of which is provided with two or three feet of sand on the top of burlap. This removes any remaining trace of slime, cleaning the solution so that it is fit to go to the precipitation-house.

Returning to the treatment-vat; the slime remaining after decantation undergoes further agitation. The vat is filled with a 0.03% solution and agitation ensues for 1½ hours. Then follow three more successive washes. The vat is then filled for the fifth time and the mixture is thrown by a centrifugal pump into a deep settling-vat. Five of the treatment charges go to one of these vats, of which there are six, each being 20 ft. deep and 34 ft. diameter, with a capacity of 450 tons. The successive charges from the treatment-vat are fed into one settling-vat until it is full of slime, for as fast as the solution gathers on top it is run off, just sufficient time being given for clarification. This clarified solution is so poor in gold and silver that precipitation is not attempted, the solution being used as the first of the washes in the treatment-vat.

The new mill contains three tube-mills. All of them were made by Krupp, at Essen. The No. 3 mill is 19 ft. 8 in. long with 3 ft. 11 in. diameter; No. 4 is 4 ft. 11 in. diameter, and 23 ft. 9 in. long, while No. 5 is of the same diameter as the last, but 26 ft. 3 in. long. The smallest

*Sodium cyanide is used, but all calculations are made in terms of the equivalent potassium cyanide. 100 lb. NaCy is equal to 128 lb. KCy, therefore in practice eight-tenths of NaCy does the work of one unit of KCy. The chemical action is the same, the lesser freight on the more concentrated form of the cyanide making the sodium preferable to the potassium salt.

of the tubes is found to do most work per horsepower required. In Western Australia the tubes or grit-mills (as they are often called) have been cut down to a length of 13 ft., but the ore at Kalgoorlie is softer, so that grinding is more quickly accomplished than at El Oro. The time required is determined directly by the hardness of the rock, for the ore is fed at the upper end and makes its exit at the lower, through a screen. Of the three types of tube-mills, the Abbé can be filled more than half full; this cannot be done with the Krupp mill because it both fills and discharges at the centre. The Davidsen has central feed but peripheral discharge, while in the Abbé mill this is reversed, the feed being peripheral and the discharge central. The last mentioned is built in sections and the driving is done on tires and by gears which circle the exterior of the shell, like a Bruckner furnace. The Krupp tube is made of wrought-iron sheets, welded; it runs on trunnions placed at one end, so that the shell does not come into play as regards the driving of the machine.



Cyanide Vats.

The lining of tube-mills is an important matter. Chilled cast iron, both that imported from Krupp's works and that made by El Oro company itself, has been tried; the latter costing one half the former and giving equal wear weight-for-weight. Krupp's lining is from ⅞ to one inch thick, El Oro lining is 1¼ in. thick. Nevertheless, it is the intention of the manager* to substitute silex, a natural flint with characteristic conchoidal fracture; it is whittled into shape in Germany before shipment, arriving in sections 2½ in. thick, 4 in. wide, and 6 in. long. The pebbles that do the grinding come from the coast of Denmark. They vary in size from that of an egg to that of a fist, the average being about three inches in diameter. They wear well, 6 lb. of pebble being abraded during the grinding of one ton of sand; the consumption of lining being 1.6 lb. An attempt is being made to select some of the flinty quartz, such as occurs in the low-grade ore of the mine, to serve as grinding material. This seems wise; if the hard portions of the ore can be used to grind the soft, the economy is obvious.

At the time of my visit, No. 3 tube was being driven at the rate of 31 rev. per min., while No. 4 and No. 5 made 29 revolutions. The duty of the individual tube-mills cannot be stated; 172 tons of the coarsest sand from the new 100-stamp mill is re-ground from 35-mesh to 150-mesh, or finer, by the three tubes. In addition, 85 tons per day of the coarsest of the 40-mesh sand coming from the old 100-stamp mill is reduced to the same condition, making the total work of the three tubes 257 tons.



Another View of the Cyanide Vats.

The tube-mills get everything above 150 mesh, as separated by cone classification. The aim is to grind to 150 mesh and this is accomplished as nearly as the capacity of the plant will permit. Any oversize is returned—as already described—for re-grinding. The cyanide treat-

* Robert M. Raymond, to whom I am indebted for much valuable information.

ment is based on making a product of sand as nearly 150 mesh as possible, while the 200 mesh and finer are treated as slime. This tube-mill practice has steadily gained in importance, the tendency being to treat a larger proportion of the product from the stamps and to augment their crushing capacity, while enlarging the cyanide annex. This is a proper way of meeting the necessities of a mine the output of which increases in tonnage as the grade declines.

The Value of Detonating Caps in Blasting.

By ROLAND L. OLIVER.

*Detonators or blasting caps are made in several different grades of strength, because some powders require not only a greater, but a different initial detonation than others to convey their maximum energy through a whole charge, and the detonating qualities of each powder vary with changes in its physical condition—whether it be warm or cold, rigid, plastic, homogenous or otherwise.

The full significance of 'detonation' as applied to high explosives will become apparent in the course of this paper, but it may be stated briefly that detonation is a very much higher degree of explosion than that produced by fire alone or by a blow. While either of these will explode powder under certain conditions, neither of them will cause it to produce its greatest effect. An explosion is merely the rapid transformation of powder from its solid or liquid state into gases which struggle to occupy a space hundreds of times greater than that occupied by the original substance; but in order that these gases produce their greatest rupturing force on the surrounding material, they, too, must be expanded suddenly to their greatest possible volume. This requires a practically instantaneous decomposition and oxidation at maximum temperature into their simplest elements, the result being the highest degree of explosion, which is called 'detonation' and which can only be produced by a peculiar combination of intense heat and concussion, such as is supplied through the agency of detonators, or blasting caps, as they are commonly called. Hence, a thorough detonation of powder is controlled by the cap, the nature and strength of which is as essential to successful results as is the powder itself.

The susceptibility of powder to detonation depends more upon the nature of its ingredients and on the physical conditions previously mentioned than on the amount of nitro-glycerine or other high explosive which it may contain. For instance, ordinary dynamite with 40% nitro-glycerine is easier to detonate thoroughly than a gelatine dynamite containing even as much as 80% of nitro-glycerine, because in the first the liquid nitro-glycerine is merely absorbed mechanically in a dope, whereas in the latter it is chemically transformed with gun-cotton into a gelatinized mass which is harder to detonate and harder to make transmit its detonation through a whole charge of it than ordinary dynamite; that is, a comparatively weak cap will detonate a longer charge of straight dynamite than of gelatine dynamite, yet gelatine dynamite when detonated with a suitable cap is somewhat stronger than ordinary dynamite containing the same amount of nitro-glycerine and possesses greater shattering effect.



Looking Down the Valley From El Oro.

A spark will detonate fulminate of mercury; two grains of fulminate will detonate nitro-glycerine; but it requires at least 10 grains of fulminate to detonate gun-cotton. That there is something more, however, than the actual force and quickness of these 10 grains of fulminate, is shown by the fact that although the mechanical force of nitro-glycerine is more than that of fulminate of mercury, ten times more nitro-glycerine, or 100 grains, will not detonate gun-cotton; it will only scatter it; yet a small quantity of dry gun-cotton, which is slower than nitro-glycerine, will easily detonate nitro-glycerine and even wet gun-cotton, which are the two extremes, nitro-glycerine being one of the most sensitive and wet gun-cotton one of the most inert forms of high explosives. Therefore the equilibrium of the different chemical molecules of these powders is susceptible to explosion not merely by the force of the shock, but by different kinds of impulses or vibrations. Another example of the disruptive effect of a particular wave motion without especial mechanical force is the glass globe frequently exhibited in physical laboratories which withstands a strong blow, but is shattered by the mere vibration of a particular musical note, whereas a note of different tone

*A paper read before the California Miners' Association and published by the California Cap Company.

will not affect it. The different degrees of facility with which some explosives will detonate others, and their susceptibility to one kind of detonation more than to another, must now be apparent. Let us next consider the action of the same explosive under different influences. It appears to many as if when a charge of powder explodes at all, it explodes with maximum force throughout; but such is not the case. For instance, a large number of sticks of powder suspended in the air close enough to explode one another (12 to 36 in. apart, according to the kind of powder and size of cartridges used) will explode down the line for a certain distance if a detonator be used to start the first stick, but a point will be reached where one will not set off the stick next to it, showing that each successive stick of powder has lost some of its detonating force.

That its explosive force also becomes weakened as it proceeds down the line may be illustrated by placing under each stick a thin plate of soft steel over the end of a piece of 4 or 6-in. iron pipe. The force of each explosion striking these plates of steel will cup them into the hollow of the pipe and the size of the cups will diminish as the explosion gets further away from the initial detonation. It has also been demonstrated that when the first stick is fired with a weak cap the sympathetic detonation will not extend far down the line; per contra, a very stong cap or one of some other composition to which the powder is more susceptible will carry said detonation much further.

The effect of merely lighting a piece of unconfined dynamite with a squib or piece of fuse without any cap attached is to burn the dynamite quickly without exploding and make a dense smoke which has a disagreeable smell and produces violent headaches. This is simple combustion. Confine another piece of dynamite, then light in the same way and it will explode, but it will belch forth similar fumes. A weak cap (like the old single-force cap) fired in dynamite, will explode it with considerable energy, but there will still be some of the objectionable smoke. Repeat the experiment with a triple-force cap and the dynamite will be detonated with great violence, even when unconfined, developing great explosive force and very little smoke.

This illustrates the difference between combustion, explosion, and detonation, showing that the same powder may be made to transmit its energy by different means and with different degrees of intensity, from a rapid burning to a violent detonation.

The relative strengths of three well-known explosive compounds have been compared when exploded by fire simply and then by detonation. Considering the explosion from simple inflammation of gun-powder as unity, gun-cotton when exploded simply by fire is three times stronger than gun-powder, and when detonated by a cap it is six and one-half times stronger. Nitro-glycerine is five times stronger than gun-powder when exploded by fire and ten times stronger when detonated. Hence these figures explain the enormous force which is given by detonation as compared with that by simple explosion.

Gelatine powders do not transmit their explosive energy through themselves as readily or as far as regular dynamites, hence they require a stronger detonator, larger cartridges and more confinement to completely detonate a whole charge. A 3x cap gets nearly all the energy out of No. 1 and No. 2 dynamite, but gelatine dynamites, nitro-gelatine and other inert powders require at least a 5x cap to develop their energy, and a 6x or stronger cap will do it still better, especially if the charge be a long one. This relation between the length of charge, the diameter of the stick and the strength of caps is another noteworthy fact, more marked with the inert powders than with ordinary dynamite. Thin sticks require a stronger cap than sticks of larger diameter, and a long charge, especially of slender sticks, requires a stronger cap to convey sufficient impulse through the whole charge; otherwise all the powder in the hole will not be detonated.

The so-called 'fumeless' powders, meaning that their gases are not visible or noxious, are only fumeless in that sense of the word when well detonated. If the fuse burns them, or the cap is too weak, they, too, make 'stinkers' and produce headaches. A poor detonation of gelatine and other inert powders, which does not go all through the charge, will disintegrate some of the other sticks without exploding them, leaving the hole unbottomed and scattering the unexploded powder about the mine, which is dangerous. This sometimes happens when the cap has been buried under several sticks of powder and there is no tamping on top of the charge.

The matter of tamping high explosives is much debated among miners, many asserting that it is unnecessary. As a matter of fact, tamping is not so essential with high explosives as with black blasting powder, because in the one case the expansion of gases is so sudden that just a small proportion get a chance to escape, while in the case of slower powders the expansion is gradual; but in any explosive the better the confinement of the gases the greater will the effect be. The fact is, however, that most blasters use an excess of powder so as to make doubly sure of breaking the ground, and this excess also makes up for the loss of power by the escape of untamped gases.

Close confinement, by ramming the powder well into a hole so as to fill up any spaces around the charge, is also important, since much of its effectiveness may otherwise be lost. For example, a quarter of an ounce of No. 2 dynamite will throw a ball of certain weight from a mortar 300 ft. Leave half an inch air-space between the ball and the powder, and the same quantity of dynamite will throw the same ball only 210 ft., lessening the distance 90 ft. in 300, which is a loss of 30% in efficiency.

Several years ago a mining superintendent in Arizona noticed irregularities in the progress of different shifts. Some of the miners complained of unbottomed holes and bad air. He was supplying them with 40% gelatine dynamite, ¼-in. sticks and 5x caps, shift and shift alike, but with no more powder than his foreman considered was sufficient to do the work. Upon investigation it was found that one shift always rammed the charges with a wooden bar and put tamping on top, but the other shift was not tamping. All hands have been using tamping ever since, and work has proceeded satisfactorily with the same powder and caps.

Another consideration in handling any powder is the diameter of the sticks used. Seven-eighths inch sticks require more confinement and greater initial impulse than one and one-quarter inch sticks to carry the detonation through the charge, because the more powder there is in the immediate vicinity of the cap, the greater will be the initial explosive energy established, and this is essential with gelatine dynamites and other inert powders.

When powder becomes chilled, it is difficult to properly detonate it with the usual detonator, hence the advisability of using a very strong cap in cold weather. Many of the holes are frequently loaded for some time before firing; and even if the powder is soft and normal while charging, it afterwards becomes somewhat chilled in the cold ground. As said before, a 3x cap, or even a double-force cap, will detonate ordinary dynamite if it be soft and plastic. But on the other hand, if it be hard or if it should present a mottled appearance, even a 5x cap may fail to completely detonate it.

(To be continued.)

Pyrite Smelting Without Coke.---III.

Written for the MINING AND SCIENTIFIC PRESS
By LEWIS T. WRIGHT.

The specific heats of pure substances and their latent heats of fusion have been determined in some cases with extreme accuracy and we use these values in our practice, but in our industrial practice we are not often dealing with pure substances and a small amount of impurity may cause important deviations in their physical properties. It is this application of an accurate physical determination of a highly specialized case to the more or less impure bodies encountered in practice that we call theoretical. What are called 'practical' results have, generally, more interest for practical men than those commonly termed 'theoretical,' though the latter, used in a proper manner, are useful in controlling and guiding our practice; and the technician who studies the Why and the Wherefore of practice gladly avails himself of the illumination and suggestion of the so-called theory. There is no gainsaying practical results. Economically they may be good or bad, but they are something that really happens, and practice will long remain unbending before the most attractive theory. The examination of our practical results by the oblique light of theory often brings details into relief that may escape the sight when viewed in the dim perspective incidental to our daily work. Standards of possible efficiency encourage the inventor to progress, and further, the control of practical results by the accurate data of science often serves to reveal gross errors in our practical determinations and indicates the direction to that highest possible efficiency after which we are striving. No excuse will be required for an attempt to examine the results obtained in practice by the light of science, remembering of course that the physical constants we use are merely the nearest approach reached in each case by experiment, and apply to bodies in a high state of purity.

How far is it possible, for instance, to study the comparative calorific values of coke and of iron sulphides? It should be easy; but it must be remembered that the endowed departments of science have not yet determined for us all the physical constants we need and use, and that we, in the haste of output, cannot determine for ourselves.

There are certain fundamental data—such as the heat of combustion of the iron sulphides, of sulphur, and of carbon—that we can use to explain our practice of smelting, and these are stated in different kinds of calories or in British thermal units (B. T. U.)

The calorie (cal.) is often defined as that quantity of heat that is required to raise one gram of water from 0° to 1° C.; but the thermo-chemical equation contains a universal definition that will be found more useful for our purposes. For example, the equation

$$C + O_2 = 96{,}960 \text{ cal.}$$

states that 12 parts by weight of carbon uniting with 32 parts by weight of oxygen generate a quantity of heat that will raise 96,960 parts by weight of water from 0° to 1° C. These parts can be any weight-unit —tons or grams, pounds or kilograms, ounces or hundredweights—the only condition being that the weight-unit used shall be the same on both sides of the equation.

The big calorie (Cal.) contains 1,000 small calories (cal.).

The above equation is therefore often (in round numbers) written

$$C + O_2 = 97 \text{ Cal.}$$

The big Calorie (Cal.) is the one used in this article because it is much more appropriate for technical purposes than the small one, unless it may be for stating the specific heats of substances when, because of the small quantities of heat involved, the small calorie is less cumbersome.

		Per unit-weight of sulphur.
(1)	$Fe + O = 66.4$ Cal.	
(2)	$FeS + 3O = 113$ Cal.	3.55 Cal.
(3)	$FeS_2 + 5O = 237.3$ Cal.	3.70 "
(4)	$FeS + 3Fe_2O_3 = 85.2$ Cal.	2.66 "
(5)	$S + O_2 = 71$ Cal.	2.22 "
		Per unit-weight of carbon.
(6)	$C + O_2 = 96.1$	8.08 "
(7)	Coke with 83% of carbon	6.71 "

The number above given for FeS_2 is open to some doubt, but it is the best available. By analogy with some other metallic sulphides the heat value of the sulphur of the bisulphide should be less than that of the monosulphide. By comparing the two iron sulphides on the basis of the unit weight of sulphur, we find they do not differ much and no great harm will be done if we adopt the value of 3.55 Cal. for both, for present practical purposes, until the value for FeS_2 has been confirmed; and it is interesting to note that the oxidation of ferrous sulphide by means of the solid oxygen* (as in the time-honored case of the smelting of a mixture of sulphides and roasted sulphides or what is the same thing in this sense, namely, imperfectly roasted sulphide) by equation 4 only gives 2.66 Cal. per unit-weight of sulphur. From equations 2 and 6 we learn that one part of sulphur combined with iron is calorifically equal to 0.44 part of carbon or to 0.53 part of coke containing 83% carbon. How far is this relation approximated in practice?

In smelting mixed charges of pyrite and roasted pyrite with cold blast the coke consumption varies with the same make-up of charge, not because of variations in the composition of the charge, but according to the condition of the furnace. With hot blast the furnaces did not exhibit as much variation in this respect. To make a comparison between coke and sulphur, it is necessary therefore to obtain averages, by combining a large number of monthly furnace-runs, in order to compensate for the variable outside influences which appear to be working in one or other direction. In the following table are given results obtained by averaging several monthly runs in which the sulphur content of the charge was much the same for a set; and I hope that in this manner the fuel relation that exists in practice between the sulphur and the coke may be emphasized. All the sulphur in the unroasted ore is calculated as FeS_2 and all that of the roasted ore, slag, flue-dust, etc., as FeS. The sulphur combined with the copper is considered in the same manner as if combined with iron, and no inconvenience will be found to result from this assumption because we are concerned with that portion of the sulphur of the charge that becomes oxidized in the smelting process and not with the whole amount, and it will be appreciated that this amount consumed cannot be combined with the copper because that portion must be left for the matte. The small amount of zinc sulphide present will also not interfere with this method of examination of the fuel-effect of the combined sulphur of our charge, because its sulphur has the value of 3.57 Cal., which is about the same as that of the sulphur of FeS. In the table the results are calculated to unit-weights of sulphur and coke per 100 unit-weights of the actual average charge. The grade of the matte is also given.

RELATION BETWEEN SULPHUR AND COKE, USING COLD BLAST.

	S in FeS, %.	S in FeS_2, %.	Total Sulphur, %.	Coke, %.	Cu in Matte, %.	Furnace Months.
A	13.5	2.2	15.7	8.92	34.8	4
B	11.7	6.8	18.5	8.55	29.4	5
C	12.8	7.1	19.9	8.43	27.9	4
D	7.5	17.5	25.0	7.88	22.8	4

The replacement of roasted pyrite by the raw pyrite is attended in the above practice by an increase in the total sulphur, a diminution of coke, and a lower grade of matte. Of the total sulphur, 70% was oxidized to SO_2.

*Oxygen chemically combined.

On comparing the extreme members of the table we find that one unit-weight of sulphur oxidized replaced 0.159 part coke. From the heats of combustion, it should have replaced 0.53 part coke containing 83% carbon if oxidized by reaction (2) and 0.4 coke if by reaction (4). Comparing results A and C in the above table, we find that a difference of one unit-weight of sulphur oxidized replaced 0.166 coke instead of 0.53 or 0.4 respectively, as indicated by theory. Comparing A and B, which are rather close together, we find that one unit of sulphur replaced 0.188 part coke. Here are practical results of great uniformity, as such evidence goes, in the fuel relation between the sulphur and coke. It must not be forgotten that the grade of the matte is progressively varying in the above tabulated results, and also that some of the oxidization of the sulphide was taking place by means of the reaction between the ferric oxide of the roasted ore and the sulphide which in equation 4 equals 2.66 Cal. per unit-weight of sulphur or 0.4 coke containing 83% carbon. Of course the unit-weight of sulphur in question was producing heat in the furnace equal to 0.53 or 0.4 coke, according to whether it was oxidized by solid or gaseous oxygen, but it did not replace the amount of carbon it should have done. Only an examination of a thermal balance sheet would reveal why it did not do so, and it may be that by nursing the coke when the increased amounts of pyrite were put on the charge, less coke might have been used, and it may be that other metallurgists using cold blast may find a more favorable practical relation between the sulphur and the coke in the case of mixed charges if their attention is called to the facts above cited.

I will now give a similar fuel comparison between sulphur and coke in the case of warm blast. A recent writer on this subject has suggested that it would be more appropriate to call our heated blast warm rather than hot, and there is the more reason for agreeing with him because it does seem that a moderate heating of the blast serves all that is needed of it and that there is no need to use the high temperature employed in iron smelting and obtained with brick stoves. In the following table are given the results obtained with warm blast with three furnaces similar in design and operation. Each result is the average of six months' work with the same furnace. The three furnaces were working under the same conditions and exhibited much greater regularity in respect to coke consumption day by day than was shown by the same furnaces when previously working under cold blast.

RELATION BETWEEN SULPHUR AND COKE, USING WARM BLAST.

	Sulphur in FeS.	S in FeS_2.	Total Sulphur.	Coke.	Matte % Cu.	Blast oz.	Rate of Smelting: Tons per sq. ft. per 24 hr.
E	5.51	15.16	20.67	4.0	31.0	28.4	8.58
F	7.20	12.60	19.80	4.5	31.6	28.6	8.41
G	7.15	11.30	18.45	4.8	31.4	28.4	8.47

It will be noticed that, as in the case of cold blast, the coke consumption diminishes with addition of sulphur to the charge. Special attention was given to the coke consumption to reduce it to a minimum. The furnaces ran with great regularity and very fast, as will be seen from the average rate of smelting. It is calculated that 71% of the sulphur was oxidized to SO_2. On comparing the extremes, it is found that a difference of one unit-weight of sulphur oxidized is equal to a difference of 0.508 coke. This is certainly a surprising result, in contrast to those obtained with cold blast. These relations, which were not discovered at the time, serve to illustrate the value of warm blast, which, by increasing the temperature in the smelting zone, ensures more active and regular smelting of the charge.

The above results also enable us to calculate the vanishing point of carbonaceous fuel on a pyrite charge. How much additional sulphur should replace the 4% coke used when 20.67 units of sulphur existed in 100 units of charge and 14.67 units of sulphur were oxidized, or how much sulphur must be oxidized per 100 of charge to enable the coke to be entirely eliminated. From the extremes in the above table, we calculate that an additional 7.87 units of sulphur oxidized would, if the same relation between sulphur and coke continued, be sufficient to replace all the coke. That is, other things being equal, 14.67+7.87 or 22.54 of sulphur oxidized per 100 units of charge should enable the charge to be self-smelting. This is precisely what was later found to be possible, and often the furnaces ran with just that amount of oxidation. It is better, of course, to have more, say 25 units of sulphur per 100 of charge.

In setting forth furnace-results for such a discussion as this, I find it convenient to have the average charge stated and not the official charge, which is varied from time to time; it is also cumbersome for the purpose of calculations and comparisons to have the charge stated, as it often is, in some odd number of pounds as it is given to the weighers, the foreman taking off or adding on a few pounds of the different constituents of the charge from time to time according to the working of the furnace and the class of material used, and the men perhaps using more coke than is accounted for on the charge-sheets,—for is not the coke pile handy?

Having shown the relation between carbon and sulphur as fuels in copper blast-furnace practice, I would like to draw attention to the thermo-chemical aspects of the cases cited, believing that such evidence as exists, even if but approximate in some of its details, will be instructive. Again I must refer to iron smelting in blast-furnaces because it has been extensively studied for many years by highly competent observers and the heat balance-sheets prepared by them may serve as a model for those who desire to emulate an admirable example, but in so doing I want to emphasize the fact that the two operations of iron smelting and pyrite smelting are chemically opposite processes, though similar in their main physical features. The first is a reducing process, the iron oxide being reduced to metal by the agency of carbon monoxide. And the carbon is not merely the only available fuel for the physical effects of melting, etc., but it is necessary for the chemical work of the furnace. In the smelting of pyrite, on the contrary, we require to oxidize and not to reduce, and carbon, however useful it may be in raising temperature, remains counter-active to the chemical requirements of the problem.

For centuries copper metallurgists have been groping with the irrational use of carbon as a fuel, allowing it to impede the work of roasting by its reducing action and counter-active effect on the required oxidation. There is no doubt that by high development of the muffle principle, much of this counter-active effect might have been avoided in the reverberatory work in the old practice of smelting sulphide ores after preliminary oxidation. We have learned that sulphur will replace coke, as imagined and almost demonstrated by Hollway, whose method of first melting the sulphide in a cupola with coke and then converting it in a Bessemer converter is precisely what we now practice with success, with the additional advantage that by promoting the oxidation and performing the first melting without carbonaceous fuel or its minimum, we combine two highly economical pneumatic processes and conduct both by the heat of combustion of the iron sulphides without the counter-active influence of carbon.

It is usual to state iron furnace results per unit-weight of pig iron. For the purpose of illustration, I have taken a case from Mr. Gayley's practice as studied by Prof. Joseph W. Richards (Trans. A. I. M. E., p. 703, July, 1905) and have arranged his figures according to a unit-

weight of charge and not according to the weight of the valuable product produced by the furnace. I also use the big Calorie in preference to the small one.

IRON BLAST-FURNACE PRACTICE, WITH MOIST BLAST.

Heat distribution.	Calories per unit-weight of charge.
Reduction Fe_2O_3	0.738
Reduction SiO_2	0.030
Expulsion of CO_2 from limestone	0.081
Decomposition of water in blast	0.005
Evaporation of moisture in charge	0.051
Heat in pig iron	0.112
Heat in slag	0.105
Heat in escaping gases	0.198
Radiation, etc., and undetermined	0.318
Total	1.728

HEAT DEVELOPED.

C to CO	0.591
C to CO_2	0.959
Heat in blast	0.178
Total	1.728

By studying such a table of results we can cultivate our sense of proportion and realize at a glance what particular items cause the largest heat expenditures; we can also learn to distinguish those factors in which improvement is possible from those that are, like the reduction of the ferric oxide, inevitable to the process. We see how much heat is lost in escaping gases and in the molten iron and slag. In order to contrast this practice with pyrite smelting without coke I have prepared the following table in order to show to what extent the two processes resemble or differ from each other.

TABLE A.—PER POUND WEIGHT OF CHARGE.

	Iron blast furnace.	Copper pyrite smelting.
Air used, volume	26.4 cu. ft.	33.00 cu. ft.
Air used, weight	1.9 lb.	2.43 lb.
Slag produced	0.26 "	0.55 "
Pig produced	0.45 "	.....
Matte produced	.....	0.23 "
Charge smelted per sq. ft. of hearth-area per min.	8.7 "	12.5 "
Blast-pressure per sq. in.	15.0 "	2.0 "
Height of ore-column	70.0 ft.	6.0 ft.
Temperature of escaping gases	230° C.	800° C. (estimated)
Calories per unit-weight of charge developed or expended	1.728	1.082
Critical or working temperature	1,510° C.	1,250° C. (estimated)
Temperature of blast	382° C.	222° C.

In contrasting the two processes we notice that the copper furnace takes more air but at a much lower pressure, the last because the height of ore-column is so much less. The slag in pyrite smelting is more than double the other, but the matte is in weight but one half as much as the pig produced by the iron furnace. The copper furnace drives about 50% faster. The temperature of the escaping gases is unfortunately very much higher in the copper furnace because of the low ore-column, the faster driving, and the uncomfortable fractional combustion of the sulphur of the pyrite. The temperature of the escaping slag and metal is higher in the iron furnace because of the high temperature of fusion of cast iron, as compared to that of copper matte. The temperature of the in-going blast is much higher in iron smelting and the total heat required is greater, because of the large amount of endo-thermic chemical work to be performed. The numbers given in Table A will serve for the preparation of a heat balance-sheet for pyrite smelting, per unit-weight of charge. The important items are as follows:

HEAT IN ESCAPING GASES.—The temperature of these was not determined, but estimated, from the color of the heated particles of flue-dust on the top of the furnace, at 800° C. It is an unfortunate feature of pyrite smelting that the furnace-top is so hot, because, as explained in a previous article, the sulphur of the charge burns in a fractional manner and partly toward the top of the furnace. The temperature of the gases being high enough to agglomerate some of the flue-dust, this, in falling back to the sides of the furnace helps in building the accretions which form the scaffold, the closing up of which eventually causes the shutting down of the furnace. The specific heat of the gases is calculated for a gas of the following composition:

SO_2	0.100
O_2	0.058
N_2	0.842
Total	1.000

On an average, it is probable that the percentage of SO_2 in the furnace gases would be less than 10%. Allowance has been made for the generally neglected increase of specific heat at increasing temperatures. The mean specific heat of a gas of the above composition was found to be 0.392 at 800° C. or 0.00049 Cal. per unit-weight of charge per 1° Centigrade.

HEAT IN SLAGS.—This has been calculated for a temperature (estimated) of 1,250° C. The specific heat of the slag was found to be 0.00016 Cal. per 1° C. (between 0° and 100°) The increase in the mean specific heat was assumed to be 0.07% for each degree and the latent heat of fusion given by Voigt for 2 (FeO) SiO_2, namely, 0.085 Cal., was taken. The total heat in the slag at a temperature of 1,250° C. was thus calculated to be 0.46 Cal. per unit-weight of slag; $0.55 \times 0.46 = 0.253$ Cal.

HEAT IN MATTE.—The specific heat of this between zero and 100° C. was found to be 0.00016 Cal. The mean increase with increased temperature is estimated at 0.000064 per degree. The latent heat of fusion was calculated for a mixture of $\frac{1}{3}$ Cu_2S and $\frac{2}{3}$ FeS by the empirical rule. In that manner the total heat in the matte was calculated to be 0.33 Cal. per unit-weight of matte for the estimated temperature of 1,250° C. or per unit-weight of charge; $0.23 \times 0.33 = 0.076$ Calorie.

HEAT IN COOLING WATER.—This was determined and found to vary between 0.06 to 0.13 Cal. per unit-weight of charge, according to thickness of crust and rate of running of furnace. The mean loss, namely, 0.095 Cal., is taken.

THE HEAT IN THE MOISTURE OF THE CHARGE.—The average moisture was 3.5% and this is consequently 0.035 by 0.6 Cal. or 0.021 Cal. per unit of charge.

The decomposition of the limestone is 0.04×0.451, or 0.018 Cal. per unit of charge.

The decomposition of water (moisture) in the blast is calculated for ordinary atmospheric conditions.

Some allowance for loss of heat by radiation is necessary.

For the heat developed at the rate of 0.25 unit-weight of sulphur oxidized and adopting the heat of combustion of FeS, namely 3.55 Cal. per unit-weight of sulphur, we have,

$$0.25 \times 3.55 = 0.89 \text{ Cal.}$$

The heat of combination of 2 (FeO) and SiO_2, I do not know. That of FeO plus SiO_2 as given by Prof. J. W. Richards (Metallurgical Calculations—Electro-Chemical and Metallurgical Industry, March, 1905) is 0.189 Cal. per unit of Fe. For the slag in question, which approximates 2 (FeO) SiO_2, 60% of the above value has been taken.

$$0.189 \times 0.6 \times 0.22 = 0.025 \text{ Cal.}$$

HEAT IN THE BLAST.—This is $0.303\ (222°) + 0.000027\ (222°)^2 \times 2.43 \div 1000$, to reduce to big Calories, $= 0.167$ Cal.

The calculations are made, as is usual, from a temperature base-line of 0° C., and I have added the equivalent percentage-weight of coke that would furnish the amounts of heat in question.

A summary of these items gives per unit-weight of charge:

Heat expenditure.	Calories.	Coke equivalent % Calories×100 / 6.71
Escaping gases	0.392	5.84
Heat in slag	0.253	3.77
Heat in matte	0.076	1.13
Heat in cooling water	0.095	1.40
Evaporation of moisture in the charge	0.021	0.31
Decomposition of limestone	0.018	0.27
Decomposition of water in blast	0.073	1.09
Radiation and difference	0.154	2.30
Total	1.082	16.11
Heat developed.		
Combustion of sulphides	0.890	13.26
Combination of FeO and SiO_2	0.025	0.37
Heat in blast	0.167	2.48
Total	1.082	16.11

We see that the heat in the blast is only about 40% of the heat in the escaping gases. A hot-blast stove heated by these escaping gases should easily furnish the temperature required, but it would have to be so arranged as not to impede the escape of the gases to the stack or interfere with the operation of the furnace. It is obvious that the slag produced rises or falls with the oxidation of the iron sulphide and the effect of changes in these particulars can readily be estimated.

On first investigating the heat expenditure by inferential methods I was inclined to believe that the work of a pyritic furnace could be carried on with less than the above amount of heat. I had not allowed enough for the hot top, so persistent and annoying with all pyrite charges.

To give the values of the segregated items of heat-expenditure a form entirely practical, I have annexed to each the equivalent percentage weight of coke of 83% carbon burned to carbonic acid that would produce the amount of heat in question. This is obtained by dividing the calories per unit-weight of charge by 6.71, which is the calorific value of the coke (see equation 7), and multiplying by 100 to bring the result to a percentage.

The fundamental principles of thermo-chemistry, such as the conservation of matter and energy, are like those of other established sciences, beyond cavil. Certain numerical data, such as the specific heat of a substance, may be open to a little doubt, but this doubt rests generally within small limits that can be neglected in practice.

The heat in the cooling water takes an amount of heat equal to a fuel consumption of about 1.5% coke. The loss of heat in the escaping gases is serious, but even if it could be reduced one-half by discharging them at a temperature a little above that of the iron blast-furnace with its 70 ft. of ore-column, the loss of heat in that manner would equal about 2% coke. These heat-losses are inevitable. A furnace making much slag loses proportionately more heat. A study of the heat-losses of a furnace is instructive, since it is possible to calculate fairly closely what they may be for any case. To follow this path of inquiry a little further, we may ask what would be the heat requirement in terms of coke (83% carbon) for a charge consisting only of slag. This is the simplest case we can imagine. The chemical work is nothing and we have only to do with physical properties.

In the iron furnace the radiation losses are generally included with the 'difference' or 'undetermined.'

The heat in the cooling water may be equal to 2% coke.

That lost by radiation is perhaps as much. The heat in the escaping gases will hardly be much less than 4% coke. The simple heat in the melted slag will require about 6% coke. Thus, in order to melt a neutral substance like dry slag in a water-jacket furnace, an amount of heat will be required in terms of coke percentage, thus:

Heat in slag	6.0
Heat in cooling water	2.2
Heat radiated	1.5
Heat in decomposing water of blast	1.0
Heat in escaping gases	4.0
Total	14.7

According to the accepted heat of combustion of FeS, this amount of heat is equal to the combustion of 27.5% of the charge as sulphur. (The higher amount of sulphur in this case over that of pyrite is because one unit-weight of slag is produced per unit-weight of charge.)

The metallurgist has to face the facts, and no amount of ingenuity on his part will enable him to produce matter and energy from nothing. There will be a minimum heat-expenditure, below which he will not be able to go in any particular operation. His concern is not to exceed this irreducible minimum.

It has been shown in these articles that the smelting of pyrite has been carried on without coke with warmed blast when the sulphur oxidized equalled from 23 to 25% by weight of the charge, and also that the heat of combustion of the oxidized sulphur supplemented by a small addition to the temperature of the blast, accounted for the necessary losses of heat from the furnace. It has been further shown that with warmed blast and when the amount of sulphur oxidized was from 13.1 to 14.9% of the charge and a small percentage of coke was employed, the fuel-relation between sulphur and coke approximated that indicated by theory; and also that the vanishing point of coke on the charge with additional sulphur oxidized, agreed with that calculated from the relation discovered in practice and very closely with that suggested by theory.

Thus, as regards quantity of heat, theoretical considerations confirm and explain the practical results. There still remains another point of view, and that is the *degree of temperature* as apart from quantity of heat. For example, we may have an infinite supply of heat at a temperature one degree lower than that of the point of fusion of copper matte and never be able to melt it. This point of view of temperature suggests two important questions; what is the working temperature of a copper-matting furnace? and what is the temperature of combustion of the iron sulphide?

The working temperature must be higher than that at which the matte and its accompanying slag solidify. The point of fusion of copper matte is about 1,180° C., and that of the accompanying slag 1,100° C. The working temperature must therefore be higher than 1,180° C.; I have judged it to be 1,250° C.

Now we have to determine the temperature of combustion of the iron sulphide. Pyrite does not burn homogeneously, and we are therefore not concerned with its temperature of combustion, but with that of the residual iron sulphide (FeS) left on the heating of the pyrite. (It may be that the iron sulphide in question may be not precisely of the exact formula, FeS, but much more complex, though closely approximating to such formula, that moot point will not affect this technical discussion.)

To calculate the temperature of combustion of FeS burning in air, we must know what excess of air is employed. I have already shown that an excess is required. Analyses of the furnace gases taken from the immediate top of the furnace charge and in such a manner that no air from above the top of the charge could contaminate the samples, gave from 5 to 10% of SO_2. Calculation shows that FeS burning to FeO and SO_2 in 50% excess of air would give a gas of the following composition: 9.7% SO_2, 7.4% O_2 and 82.9% N_2. The temperature of such a gas would be raised by the heat of combustion of sulphur (heat equation No. 2) from 0° to 1,319° C. With 100% excess of air, the gases would consist of: 7.24% SO_2, 10.7% O_2 and 82% N_2, and their temperature would be 1,032° Centigrade.

It will be apparent that with a range of air-excess such as is revealed by the composition of the furnace-gases, the temperature of combustion of the iron mono-

sulphide is likely either to be below the melting point of the copper-matte or dangerously near it, and there need be no surprise if our attempts to smelt pyrite without coke and with cold blast failed. The temperature of combustion of the iron sulphide can easily be supplemented by raising the temperature of the blast or by using some coke; but the latter will have a counter-active effect upon the oxidation of the pyrite and this we desire to avoid.

Thus the use of warm blast is a logical sequence of a theoretical examination of the heat and the other reactions involved; and these in their turn explain our practical experience that, without coke and with cold blast, pyrite is not self-smelting.

Cyanide Poisoning.

*In cases of poisoning, everything depends on prompt action, for the chance of recovery is extremely small after the lapse of a very few minutes if a fatal dose has been taken. One person should be despatched for the nearest medical assistance that is available, but no delay in treatment should be permitted to occur on this account. The first care must be to neutralize the rapid poison by the antidote, and then to empty and wash out the stomach as soon and as completely as possible.

The antidote consists of two solutions sealed up in bottles, and a sealed powder. The two solutions are to be first mixed together in the tin vessel in which they are packed, by breaking off the sealed ends of the bottles. The tube containing the powder is also to be broken and the whole of the powder added to the mixture, and the dose is to be administered as soon as can possibly be done. If the patient is still conscious, he must drink the antidote at once without waiting for the insertion of the stomach tube, but if not conscious, or not responsible, then a small gag must be firmly inserted between his teeth, so as to prevent the stomach tube from being bitten off, and the tube is then to be passed down his throat and into his stomach. The antidote is to be poured down the tube, and is then to be followed by some water.

In any case, either before or after the antidote has been taken, the stomach tube is to be inserted, and about half a pint of water is to be poured down it, the patient being placed in a reclining position, a little raised from the ground. The insertion of the tube may produce vomiting; this, however, is entirely favorable to the course of the treatment. When the last of the water is placed in the funnel, and before it has all descended into the tube, the funnel end of the latter is to be lowered so as to cause the tube to act as a syphon, and the stomach emptied as much as possible of its contents. Fresh water is to be poured down the tube, and the stomach again emptied, and this is to be repeated several times, so as to thoroughly wash out the stomach. When this has been done, the tube can be withdrawn.

If the tube be not at hand, every endeavor must be made to induce vomiting after the administration of the antidote, while an equal endeavor must be made to cause the patient to swallow more of the antidote between the intervals of vomiting, if the administration be not already and completely made.

Vomiting may be induced by an emetic, like mustard, or by tickling the back of the throat with a clean feather, or a piece of clean india rubber tube, or the finger. An ample quantity of warm water should be swallowed and vomited, so as to wash out the stomach as in the previous case. Should warm water not be at hand, cold water may be employed in its place.

As soon as the stomach has been satisfactorily emptied and washed, and the stomach tube withdrawn, steps should be taken to bring about artificial respiration. Should the patient appear to be in a state of collapse, and his breathing have ceased to be noticeable, the application of smelling salts or of ammonia to his nostrils may itself induce breathing again; but if this be not immediately successful, the patient should be treated as is done in cases of partial drowning or suffocation.

Medical assistance should by this time have arrived; indeed, if the patient be conscious, there is now great hope that the worst effects of the poison will have passed off, particularly if the details of the treatment have been all carried out, for cyanide poisoning is usually fatal within twenty minutes.

The package for treatment should consist of a tin vessel with lid, in which are packed:

(a) A hermetically sealed bottle, containing 7½ grams of ferrous sulphate dissolved in 30 c. c. water; and

(b) A hermetically sealed bottle, containing 1½ grams of caustic soda dissolved in 300 c. c. water; and

(c) A tube containing 2 grams of magnesia.

There should be also a gag for the purpose of opening the clenched mouth of an unconscious person, and a stomach tube, that can be passed through the gag and down into the œsophagus into the patient's stomach. This is very easy to effect, but several persons in charge of the plant should receive instructions from the nearest medical man as to how to insert a stomach tube so that they may know how to use it should occasion at any time arise.

The apparatus should never be allowed to be removed from its place, but always kept complete and ready for an emergency. It is advisable to keep it in duplicate, in prominently marked positions in the works.

*From the *Monthly Journal* of the Chamber of Mines, Western Australia.

IN NORTHERN RHODESIA, South Africa, Broken Hill is the present railway terminus. The mining field consists of a number of kopjes which are to be quarried for the zinc and lead ore which they contain. Of this ore there is said to be 750,000 tons in sight, going down to the water level at 30 ft. The mines are now being worked, and the first total shipment of zinc ore was sent from Beira to Swansea, Wales, in August. The zinc ore is quarried and calcined on the spot. The ore gives 50 or 60% zinc, and the cost of mining and sending the ore to Wales, including all charges, should be about $19 per ton. Arrangements are being made for continuous shipments, and it is intended to work the mine up to 500 tons of ore per day. Railway surveys are being made to Bwana M'Kuba, about 100 miles north of Broken Hill. Mines there are rich in copper. The old workings by the natives are 2,500 ft. in length, and 100 ft. deep; they show two veins, one 12 ft. and the other 8 ft. wide, with a space of 30 ft. between them. The two come together and form a body of ore 12 to 15 ft. in thickness. The veins have been proved to a depth of 280 ft., and the copper averages 15%. A feature of the mines is the extraordinary malachite caves, which go down to a depth of 60 ft. at one place in malachite which contains 35% copper.

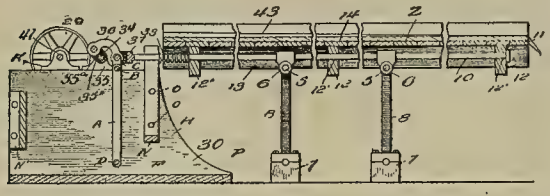
ALL science starts with hypothesis — in other words, with assumptions that are unproved, while they may be, and often are, erroneous; but which are better than nothing to the seeker after order in the maze of phenomena. And the historical progress of every science depends on the criticism of hypothesis — on the gradual stripping off, that is, of their untrue and superfluous parts — until there remains only that exact verbal expression of as much as we know of the fact, and no more, which constitutes a perfect scientific theory.

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

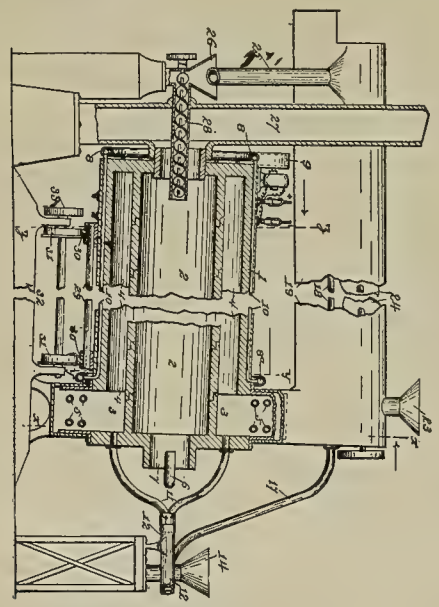
ORE-CONCENTRATOR.—No. 829,443; Walter R. Thurston, Douglas, Arizona.

A concentrator comprising a stationary hopper having discharge-openings, a distributer below the hopper for conducting the material discharged from the hopper, an oscillating disk-shaped or concave pan below the distributer for receiving the material from the distributer at points adjacent to the outer edge of the pan, an overflow-pipe for the waste having an inner sleeve passed centrally through the pan, and adjustable vertically within the pan, a stuffing-box on the pan through which the pipe passes, a central shaft for supporting the pan and overflow-pipe, means for oscillating the pan and overflow-pipe about the axis of the shaft, a spout leading from the overflow-pipe, and a valve-controlled discharge-spout leading from the pan at a point exterior, but contiguous to, the overflow-pipe, for the discharge of the concentrate.



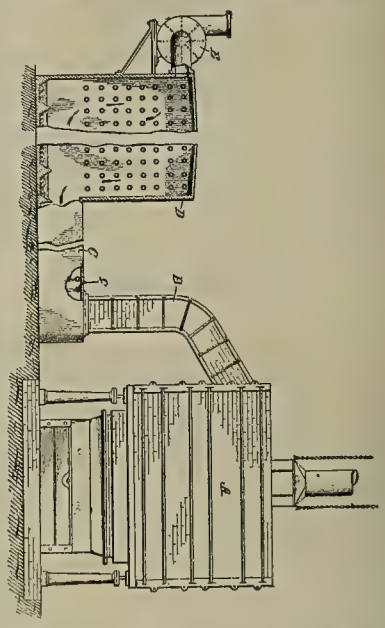
ROASTING AND VOLATILIZING FURNACE.—No. 829,843; Selden I. Clawson, Salt Lake City, Utah.

In an ore-roasting furnace, the combination, with a revoluble cylinder, having a fire-box, a central muffle extending through the cylinder and fire-box, a series of fire-box chambers surrounding the muffle, and means for feeding ore to the muffle, of the ore and coal heating pipes, a series of pipes carried by the cylinder for inducting hot air into the muffle, and a series of pipes coupled to the coal-pipe for inducting coal into the fire-box.



PROCESS FOR RECOVERING SULPHUROUS OXID.—No. 829,765; Franklin R. Carpenter, Denver, Colorado.

The herein-described process of separating sulphurous oxid from furnace-gases, which consists in first separating from the furnace-gases dust or solid particles mechanically carried over from the furnace, refrigerating the gases thus cleaned to approximately 0° Centigrade to cause the sulphurous oxid contained in the gases to be absorbed by the watery vapor therein and to be condensed or concentrated and deposited, separating the sulphurous oxid from the fixed gases and carrying off the fixed gases thus separated.

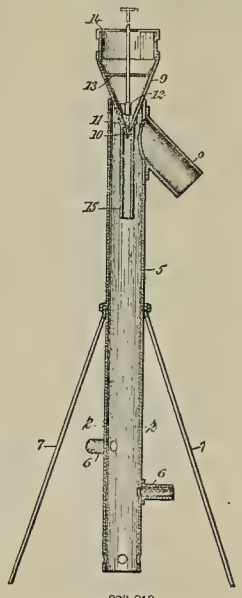


ORE-ROASTER.—No. 829,819; Ray E. Wickham, University, North Dakota.

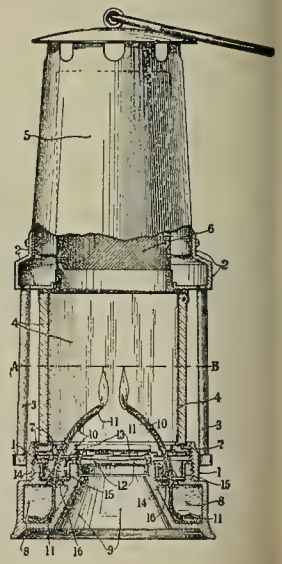
An ore-roaster comprising a stand-pipe open at the bottom, tubes communicating with the interior of the stand-pipe for introducing from without the stand-pipe gas or liquid fuel, a hopper on the upper end of the stand-pipe, and having an outlet, a tube extended from the outlet end of the hopper and into said stand-pipe, and a feed-regulator.

MINER'S SAFETY AND OTHER INCLOSED PORTABLE LAMP.—No. 829,757; William Best, Morley, England.

A miner's safety or other inclosed portable lamp provided with a base portion or oil-chamber of annular or other form having a central conical aperture closed at the top by one or more glasses or lenses, said oil-chamber being provided with one or more wick-tubes protruding and projecting inward so as to bring their flame over the said glasses or lenses which allow the light of the lamp to pass downward through the conical aperture to beneath the lamp.



829,819.

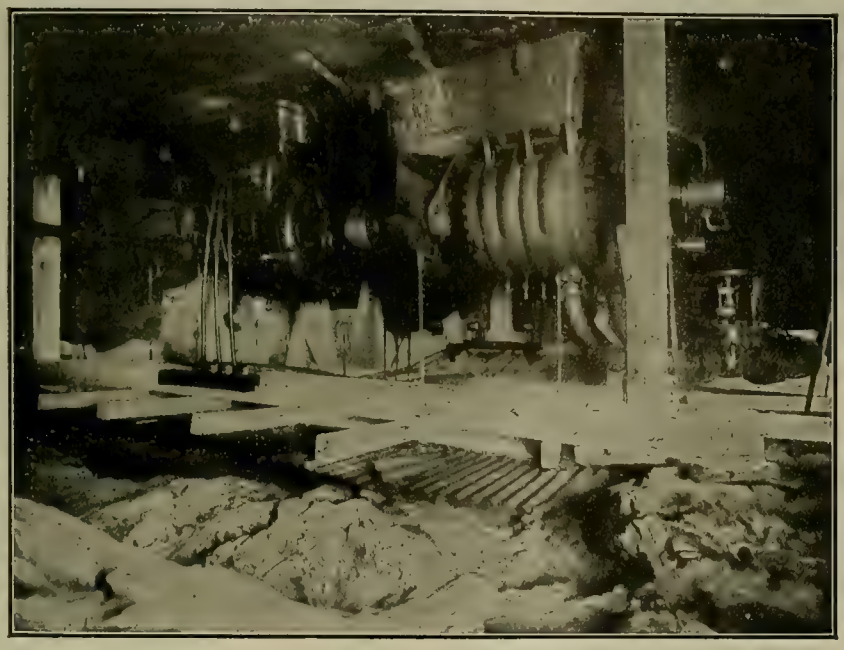


829,757.

Mine Drainage Engineering.

By RICHARD C. WILLIAMS.

The reciprocating pumps of today have attained the limit of their efficiency and now the centrifugal type has been perfected until for some purpose it far surpasses that of the older style. This development in pumping practice has occurred only within the last ten years and that is the reason why the users of pumps have begun to realize the advantages and possibilities of the centrifugal pump. In the first place, the design of a reciprocating pump is such as to place it at the bottom of the list for mine drainage purposes, for no service is more exacting. The operator must supply a pump that will not eat up profits in cylinder repairs because of grit in the water, he must have a pump constructed so that the solids dissolved from the rock by the water will not cut the metal in a short time, and he wants a pump that is the most efficient in terms of power consumed.



Eight-Stage Centrifugal Pump in North Star Mine, California.

How does the centrifugal pump work? Anyone who has ever held a pump-handle understands the reciprocating action, but possibly the centrifugal is an enigma to him. The same man when he was a boy amused himself with a stone or horse chestnut on the end of a string, whirling it around his finger until at the highest speed he let go and watched the missile shoot through the air. The law is that a body always tends to move in a straight line and if constrained to move in a curve it exerts a strain on the string or spoke, as in the case of a fly-wheel, which is proportional to the square of the revolutions per minute. This is why when the governor on an engine fails to work and the engine increases in speed it is not long before an enormous strain is placed on the metal in the fly-wheel. In the centrifugal pump the water is introduced near the centre of the rotor or impeller and by centrifugal force it is thrown toward the outside of the casing; the next portion of water thrown out forces portion number one up the pipe toward the surface. A centrifugal cannot be started without having the interior filled with water, for the strength of the action depends on the mass of the rotating body and the mass of air contained in the pump-casing is not sufficient when the pump is started to produce suction enough to draw in the much heavier water. The use of centrifugal action for moving air, however, is in familiar use in the fans used for ventilating, the centrifugal fan being in exact parallel with the pump, allowing for difference of construction to accommodate difference of material handled.

The main idea of construction in the centrifugal pump is the most laudable any machine could have—only one moving part, the impeller. This secures freedom from wear; for what is desired, in mines particularly, is the ability to handle large particles of solid matter such as mud, sand, sticks, ore, and even fair sized stones, without in any way interfering with the operation. Moreover, the oil saved by the use of a centrifugal pump—instead of reciprocating—has sometimes paid the interest on the investment. It has also been proved in practice that the type is best for mine drainage, for with low heads the friction and eddy losses bear a high proportion to the energy expended in water pumped.

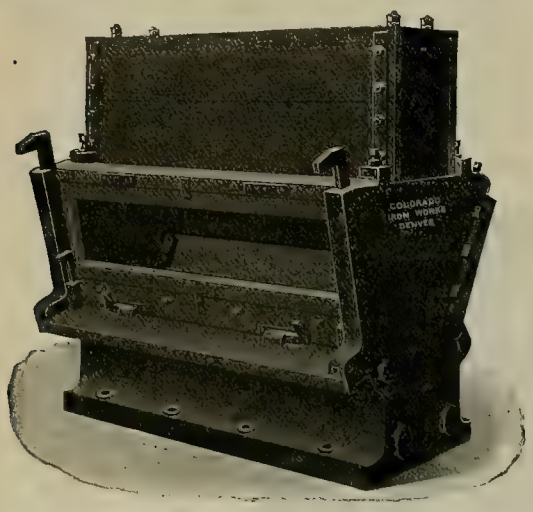
Without elaborating on those features of the design which do not concern the mine owner—but the engineer who constructs the machine—we will consider the reasons for the use of multi-stage turbine pumps. Why not use a single impeller of larger diameter and faster speed? Experience indicates that such are not so economical of operation as the turbine-pump combinations. Imagine a main shaft 200 ft. deep, drained by two single centrifugal pumps, each capable of raising water 100 ft. and to save room and lost energy the exhaust of the lower pump is directly connected to the inlet of the upper, which forces the water on its lost 100 ft. of travel toward the surface. But the friction and other losses due to not pumping the water in motion when once gotten under way in the first pump, and the added expense of two motor-units instead of one, caused engineers to ask, "Why not put both pumps side by side, mount the impellers on the same shaft, and have one motor, one attendant, and one installation instead of two, three, seven, or eight?"

The turbine pump is not different in its action from a single pump, but by each impeller doing its share of the work on the water, the diameter and speeds of the rotors are kept within practical limits. But this combination introduces new problems. If the water be introduced on the same side of each impeller, an enormous end-thrust would result; so in the best pumps the water is admitted on one side of the first and on the opposite side of the next impeller. Owing to the high velocity of the water leaving the impeller, how can the velocity be transformed into pressure with the least loss? This is accomplished by means of a 'diffusion' ring—a scheme of nozzles, into the small end of which the water from the impeller is discharged. By passing into increasing cross-section, the velocity is lowered and the static pressure raised.

The question of leakage is one of mere mechanical detail which requires only good design and careful construction to compensate for, while that of water friction depends on surface wetted by contact with the water and change of direction of flow, and this requires great skill and experience both in design and construction. The efficiency obtained from centrifugal pumps varies from 60 to 80%. The eight-stage pump shown in the illustration was furnished by the Buffalo Forge Co., of Buffalo, N. Y., one of the largest builders of centrifugal pumps in the world, to the North Star mine at Grass Valley, Cal. This pump, under head of 1,400 ft., makes 1,800 r. p. m. and is driven by a 250-h.p. motor. The North Star Mining Co. is one of the most progressive in the United States; the mine has attained a depth of 4,600 ft. on the dip of the vein, this being equivalent to 1,800 ft. vertical

Sectional Mortar.

The accompanying illustration represents a sectional mortar for the standard five-stamp battery manufactured by the Colorado Iron Works Co., of Denver. It is especially suited for transport by means of pack-animals to mountainous regions too precipitous for other and better methods of conveyance. The vertical sections of the heavy base-plate are held together by four through-bolts, and all



the faces where the sections are joined are machine-planed so perfectly as to make a precise fit. This gives the mortar a neat symmetrical appearance when set up, making it as solid and serviceable as are those not sectionalized. The mortar is arranged for inside amalgation, and a splash-plate may be attached to the lip if desired. No piece weighs more than 300 lb. In like manner, the entire milling plant may be built in similar sections where mule-back transportation is required.

Commercial Paragraphs.

THE BUTTE ENGINEERING & ELECTRIC CO., at 884-886 Folsom St., San Francisco, is making a specialty of equipping mines with hoists and electric appliances.

THE COMPRESSED AIR MACHINERY CO., of San Francisco, reports the sale of a 13 by 14 by 16 duplex Giant air-compressor to the Oriental Con. Mining Co., of Korea.

THE CHICAGO PNEUMATIC TOOL CO. reports the month of August to be the heaviest in the history of the organization, both in business booked and shipments made, the latter exceeding all previous monthly records, 15 per cent.

THE JOSHUA HENDY IRON WORKS has been incorporated with a capital stock of $1,000,000 to take over the Joshua Hendy Machine Works. John H. Hendy is president and F. J. Behniman manager, with M. F. McGurn and Charles C. McGurn as directors. This incorporation takes place just 50 years after the formation of the original company.

THE UNITED IRON WORKS, Oakland, Cal., reports having received three first prizes at the Sacramento, Cal., State Fair for the best pump for mining purposes—the Eclipse step-pressure, the best water wheel—the Tuthill tangential, and the best general exhibit. It reports the sale of three French excavators and water wheel to the Suffolk Excavation Co., at Keystone, Wyoming.

CHAS. C. MOORE & CO., ENGINEERS, of 63 First St., San Francisco, is the first machinery house to be re-located at its old site. All temporary offices have been discontinued. The company is making a specialty of equipping and constructing complete milling and cyanide plants. It has now under construction a 50-stamp mill at Wadsworth, Nev., and a 100-stamp and a 60-stamp mill at Tonopah.

THE FOUNDATION COMPANY, of New York, has been awarded contract and is just about to begin work on the two mining shafts for Pickands, Mather & Co., of Duluth, Minn. Both of these shafts are located at Biwabik, Minn. The owners encountered so many difficulties in attempting to reach the ore deposit and constructing a working shaft that they decided to contract with The Foundation Company for the construction of two shafts by the pneumatic caisson process.

Wm. A. Hewitt, of the HEWITT MACHINERY CO., of San Francisco, has just returned from an extended Eastern trip. While at Victor, Colorado, Mr. Hewitt was an interested observer of the machine-drilling contest recently held there between six makes of drills, and in which the Shaw drill was declared the winner. The Hewitt Machinery Co., at 503 Monadnock Bdg., San Francisco, is Pacific coast agent for the Shaw Eclipse air-hammer rock-drills and drill-sharpeners, and also for Blaisdell air-compressors, Jeffrey Badger rock-drills, Chalmers & Williams general mill and mining machinery, stamp-mills, Frue vanners, ore feeders, Kilbourne & Jacobs ore cars, skips and cages, steam and electric hoists, contractors' hoists and equipment, wood-working and iron-working tools, and boiler-makers' supplies. A large stock of the above machinery is *en route*. See their full-page advertisement on page 2 of this issue.

Trade Treatises.

THE TRAYLOR ENGINEERING CO., of New York City, has issued Catalogue No. 1, Stamp-milling Machinery. It is of convenient size and beautifully illustrated.

ALLIS-CHALMERS CO. has issued Bulletin 1,416 describing the Gates rock-breaker in its various forms and sizes. The sectional views in this pamphlet are superior, and show every working detail of these machines.

THE CHICAGO PNEUMATIC TOOL CO. has issued Catalogue XIX, a handsomely illustrated booklet, showing the varied uses of its pneumatic stone-cutting tools, from the sculpturing of the most delicate tracery in marble to the quarrying of gigantic blocks of stone.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., has issued an interesting illustrated pamphlet, showing some of the noted ruins in San Francisco, where the Silica-Graphite paint, manfactured by this company, had been used, and which seems in a remarkable manner to have protected the surfaces over which it was spread.

A neat brochure has been issued by LACLEDE FIRE-BRICK MANUFACTURING CO., of St. Louis, Mo., descriptive of the refractory bauxite bricks made by them. It describes the results of a severe test made, extending throughout a year, in the kilns of the St. Louis Portland Cement Co. The data given are valuable to those using refractory furnace linings.

POWER AND MINING MACHINERY CO., of Cudahy, Wis., has issued one of the most attractive and valuable catalogues that has reached our desk this year. It treats of roasting, smelting and refining. It is magnificently illustrated, printed on superior paper, which makes the excellent halftones appear like original photographs. It is certainly a pleasure to look through a book of this kind, and no mining man can do so without feeling well paid for his trouble. It is catalogue No. 6, 'Roasting, Smelting and Refining.' Power and Machinery Co., Cudahy, Wisconsin.

L. VOGELSTEIN & Co., of New York, states that the German consumption of foreign copper for the period from January to July, 1906, was :

Imports of copper in July	8,163 tons	
Exports " " " "	619 "	
Consumption " " "	7,544 "	
Imports of copper January to June	66,679 "	
" " " July	8,163 "	
		74,842 tons
Exports " " January to June	5,564 "	
" " " July	619 "	
		6,183 "
Consumption January to July		68,659 tons

Out of the above, 7,183 tons were imported from the United States.

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Editorial.

THE TREMENDOUS industrial growth of the United States is suggested by the statistics of exports recently published. It appears that exports of iron and steel manufactures increased from a value of $41,160,877 in 1896 to $160,984,985 in 1906. During the same decade the export of copper manufactures jumped from $19,720,104 to $81,282,664. The grand total of exports was almost exactly doubled, from $863,200,487 in 1896 to $1,717,953,382 in 1906. These figures are eloquent of the growth of a country coterminous with a continent and wonderfully blessed in natural resources.

CALUMET & HECLA will soon have paid $100,000,000 in dividends. The dividend of $20 per share on 100,000 shares recently declared and payable on September 20, makes the grand total $97,350,000. The lode of the Calumet & Hecla mine was discovered by Edwin J. Hulbert on September 17, 1864, the original Calumet Mining Company being organized two months later. The annual production of copper from this mine is now 43,000 tons of refined metal, worth about $15,000,000.

AN Omaha paper prints an interesting account of the discovery of "a deposit of lava, from which a high-grade genuinely pure soap can be made." This deposit is situated near Orleans, in Nebraska. We congratulate the State of Nebraska; it can now wash its escutcheon clean and place upon it the motto: "While there is life there is soap."

THE SAN FRANCISCO POST-OFFICE has fallen on evil days. It is burdened with work beyond its normal capacity, and it is crippled for want of hands to deliver second-class mail. Seeing that the employees have to start with a stipend of $50 per month, while almost any laborer—cleaning brick on the ruins, carrying the hod, or helping a carpenter—can get from $3 to $4 per day, it is no wonder that service under the Government fails to attract. Moreover, the business of the City has spread all over the residence area of the Western Addition, so that the Postmaster is expected to make frequent delivery of mail to outlying districts, as well as to the old business centre. Every influence is being brought on the Postmaster General to get these conditions alleviated, and, if the truth be known, the community that suffered so much from the earthquake-fire would be better aided by a proper postal service than in any other way. In the meantime the local officials are doing their very best and we ask our readers on the Bay shore to be patient. The poor service does not affect delivery to those at a distance.

ACCORDING TO the official report the total area covered by mining leases in Japan amounts to two per cent of

the Japanese Empire, excepting Formosa and Saghalien. There has been a marked increase in mineral production, the value of the total output for 1905 amounting to 76,000,000 yen, an increase of 20,000,000 yen as compared to 1904. The mineral products exported had a value of 31,860,000 yen, an increase of 2,000,000 yen. Japan has jumped from sixth to fourth among the countries producing copper, her output representing five per cent of the world's production. As regards the value of coal produced, Japan ranks eighth but as regards tonnage she is equal to Germany and Austria-Hungary. In petroleum Japan equals India and takes the fifth place among countries. In sulphur, Japan is second and in antimony, third.

The Rights of Deputy Mineral Surveyors.

In response to an inquiry from Nevada, we published in the issue of August 18, page 197, our opinion as to the right of a Deputy Mineral Surveyor to locate a mining claim for himself. We are in receipt of letters denying the accuracy of this opinion, and several letters from Surveyors General and also some Land Office rulings are offered by those of dissenting mind in support of their contention that the Deputy Mineral Surveyor has no right to locate mining claims. The fact is, the United States Statutes are silent on this question, or, in other words, they do not say in terms that the Deputy Mineral Surveyor may not make a mineral location. The Land Office, however, has made several rulings, which are somewhat in conflict with each other. At one time it held that Deputy Mineral Surveyors were not prohibited from making mineral entries. Subsequently, another Secretary of the Interior decided that these officers came within the inhibition of Section 452 of the Revised Statutes and were prohibited from entering or becoming interested in any of the public lands of the United States. Still later decisions of the Land Office have a tendency in a direction somewhat contrary to the last. A case was decided by the State Supreme Court of Utah, in which the court held that a Deputy Mineral Surveyor was disqualified to make locations of mining claims. When this case was carried to the Supreme Court of the United States, that court gave no opinion on the subject. Until the matter is squarely presented to the Supreme Court, and it has rendered its unqualified opinion, the right of a Deputy Mineral Surveyor to locate mining claims must be considered at least a debatable question.

The tendency among most laymen is to belittle departmental rulings. This is wrong. It is a co-ordinate branch of the public service engaged in the monumental duty of administering the public land laws. It is aided as a rule by the best legal talent on the Attorney General's staff and is, and has been for a century, dealing with a complex system embracing all kinds of lands, construing all kinds of laws, many of which are themselves so ambiguous that their respective authors could not explain them without the necessity of explaining the explanation. Of course we occasionally encounter changed rulings and contradictory decisions, but this may be said of all human tribunals.

Too Much of a Good Thing.

In a letter from the City of Mexico which we published last week, a correspondent, who is a geologist and a mining engineer, spoke with feeling concerning the essential failure of the International Geological Congress, by reason of the excessive entertaining that marked the recent session in Mexico. If the truth be known, a similar story could be told of the majority of scientific and technical conventions nowadays. Hospitality is a generous fault, and when it is added to civic pride, there is no limit to the efforts made to entertain gatherings of distinguished men. Our friends in Mexico, for example, evidently did themselves proud, from President Diaz to the individual geologist who is helping to unravel the mysteries of rock structure on the great plateau of Tenochtitlan. But it is a kindness that defeats its purpose, for it attracts a number of the camp followers of science, dilettantes and globe trotters to whom the feast of reason and the flow of soul afford a nourishment less satisfactory than the viands of a banquet or the generous wine of a frequent toast. It is not wholly amusing to hear of courageous geologists who were unable to take their part in scientific discussions by reason of being put out of action by a combination of late hours, unwise wining and dining, the high altitude, and the languors of the tropics. But their experience is common to those who attend such congresses and conventions. Men travel from afar in order to meet their comrades in science, art, or industry, only to find that all the time needed for useful discussions, whether public or private, for comparing notes and interchanging ideas, is sacrificed to entertainments, to sight-seeing, to courtesies of which ladies form an essential feature, to grandiose speeches, and to the advertisement of the city or region in which the gathering is held. It is time the matter were faced squarely, for it is destroying the real purpose of such gatherings and will end in the abstention of the very men for whom they are organized, the while the merely sociable have "a good time." We shall run the risk of seeming ungallant by saying that, in the first place, the ladies are better at home. There is a lot of time given to courtesies that must be accorded to the gentler part of creation, there are entertainments for them in which most reasonable men are compelled to join, and, besides these distractions, many a thoughtful discussion is thrown off the track by the interruption of a feminine entrance, or the frou-frou of a silken exit. Men who could spend a useful hour in quiet chat concerning matters pertaining to their science or profession, find that whatever margin is left after official ceremonies, reading papers by title, long banquets, elaborate luncheons, and other unessential functions, has to be devoted to purely social amenities between their womenfolk. We would like to hear from our readers, for everyone goes to conventions of one kind or another, to Geological Congresses, Associations for the Advancement of Science, or Technical Societies. Shall we omit the ladies, most of the speechifying, most of the heavy dining, and bring the sight-seeing and festivity to a reasonable dose, so that we men, who want to know one another and swap yarns, can get together?

By the Way.

THE INSTITUTE IN ENGLAND.—From advance proofs of an unofficial sketch by Dr. R. W. Raymond, we quote the following interesting account of the doings of those members of the American Institute of Mining Engineers who attended the recent session in Europe:

Long before the day of meeting, it had become evident that the technical sessions provided for would give no adequate opportunity for the presentation and discussion of papers. To the "joint meeting," the Iron and Steel Institute furnished a considerable list of important contributions; and our Institute presented a still larger number, appropriate to the occasion. The president of each society read a presidential address, and some time was necessarily given to formal business. The total time which the overwhelming hospitality of our British brethren had left for technical sessions permitted one session of the Iron and Steel Institute, one of our Institute, and one to be divided between them. It may easily be inferred that little could be done in the way of reading papers. Even the little which the secretaries had expected to do was further diminished by unpremeditated discussions, etc. The room was crowded (about 600 members of the Iron and Steel Institute being in town); and everything favored discussion, except the lack of time. The sessions were highly interesting; the subjects presented were burning questions of modern practice; and those who, like myself, lamented the impracticability of a calm and leisurely interchange of views among the eminent authorities and captains of industry who were present, must comfort themselves with the reflection that the valuable essays prepared for this meeting would not have been written without such a stimulus, and that the valuable debates which did not take place in the hall at London will take place (are, indeed, already in progress) through the more deliberate process of correspondence and publication. The sessions were held in the stately hall of the Institution of Civil Engineers, on the walls of which hung the portraits of the past-presidents of that illustrious society. Some of them I had seen in life; for nearly fifty years ago, I had accompanied Sir Charles Fox to a meeting of the Institution of Civil Engineers, and had meet there the famous Brunel, Scott Russell, and other great men in the profession. Now their faces were on the wall—and the grandson of one of them was shaking my hand in welcome.

H. R. H., the Prince of Wales, was for many years an Honorary Member of the Iron and Steel Institute and Edward, King of England, is now carried on its catalogue as 'Patron.' In view of the favor he had always shown to that society and its great work and purpose, the Council determined to confer upon him, this year, the Bessemer Gold Medal—which it had similarly given to Queen Victoria in 1899. The King having signified his acceptance, the ceremony took place at an audience given to a delegation of officers and past-officers of the two Institutes. On this occasion, the proceedings were perfectly informal. The King, in simple morning dress, without insignia of any kind, entered the room in which we were assembled; we were individually presented to him by President Hadfield; he shook hands with each of us, saying he was glad to see us (or words to that effect); Mr. Hadfield presented the medal with an address of perhaps a dozen lines, comprising one or two sentences; the King replied that he was happy to receive this token from the representatives of so important an industry; and the ceremony was over. Then His Majesty asked a few cordial questions of Mr. Hadfield, who told him in reply that his society was endeavoring to return to their American visitors some of the abundant hospitality it had received on two occasions in the United States, at which the King nodded approval, intimating that he had experienced American hospitality himself, and added, "I suppose you will show them a little of this country, before you let them go home?" On being informed that we were to be taken to York, Middlesbro', Newcastle, Glasgow and Edinburgh, he expressed his satisfaction with that programme, and said, "I hope you will have a very pleasant time." A little later, remarking, "Well, gentlemen, I will bid you good afternoon," he departed as he had come, and we thereupon departed as we had come (to wit, in President Hadfield's splendid automobiles); and that was all. Nothing could have been more simple, hearty, and agreeable.

Seen thus at close quarters, King Edward appeared to be a stalwart, healthy, intelligent, and dignified and kindly gentleman; not needing to be pompous, in order to show himself great; completely at home in whatever circumstances, and instinctively able to put others similarly at ease; able to command without shouting, and to influence without either deceiving or dictating. And nothing is more striking than the absolute and universal unanimity with which all classes, denominations and parties in Great Britain hold, and declare this opinion of their sovereign.

ZEBULON PIKE.—In connection with the centennial celebration at Colorado Springs, it will be recalled that Z. M. Pike first saw the Rocky Mountains in November, 1806. The work done by this brilliant young soldier is worthy of the highest honor. He was in his twenties, a boy in years, when he made his two great journeys. He was only 34 when he was killed in battle, leading a charge against the British in the war of 1812. He had risen from the rank of lieutenant to brigadier-general, and no soldier in the country seemed to have a brighter future before him when he fell; but, had he lived, he might never have won prouder laurels than those which securely belong to him.

Pike's great opportunity came to him in 1805. The vast territory included in the Louisiana Purchase had been bought with the people's money, and the whole country was eager to know more about its new domain. Lewis and Clarke were sent by the President to traverse the great unknown in the Northwest. Pike was dispatched by the general in command of the army, first up the Mississippi to near its sources, and then up the Missouri and to the mountains in the heart of the continent. His expeditions were purely military in their organization. His companions were detailed from the army, and the strict discipline of their commander was one of the large factors in the great success he won. Here is an illustration of his discipline:

In January, 1807, Pike and his little party were near perishing hundreds of miles from succor among the Rockies. One day he heard a soldier remark, so that all might hear:

"It is more than human nature can bear to march three days without food through snow three feet deep, and to carry loads only fit for horses."

Pike waited till camp was pitched and then he called the men together and thanked them for their obedience, perseverance, and contempt of every danger.

"But, Brown," he went on, "you have presumed today to use seditious and mutinous language. This time I will pardon you, for I attribute your conduct rather to your distress than to an inclination to sow discontent. But I warn you that if you ever repeat such language you will be punished by instant death."

The special reports made by Pike on the information he collected were among the most valuable geographical documents of his time.

Special Correspondence.

Johannesburg, Transvaal.

A Boom in Diamond Mining.—Some Lucky Finds.—More Activity In Gold Stocks.—Re-patriation of Chinese.—Use of Steel for Shaft-Supports.—Working Cost at the Nigel Deep.

Tin has been dropped as the favorite horse of the "stock exchange race-course," and the gambling public has put its money on a new favorite, diamonds. For the sake of the diamond industry of South Africa, it is to be hoped that all of the diamond syndicates which have been floated will not be successful, for were they to turn out as many diamonds as the promoters expect to find, the precious stones would probably take the place of marbles and be used as toys by the children in the street. It is highly improbable that much will come of the gamble. One or two successful mines may be established. There has been much activity in diamond hunting on the Vaal river at a small place called Christiana. In this locality men have taken out licenses and some of them have been fairly lucky in finding the precious stones. During June the best find of any one digger was valued at £201, which comprised a stone of 35 carats, and 3½ carats of other stones, the result of treating 15 loads, which is a very handsome return. Many of the men were unlucky. One fellow who treated 150 loads got 1¾ carats, valued at £5 15s., and another got 35s. from 90 loads.

The record output for July seems to be the cause of the small boom in gold shares. Could the present conditions continue, and the present output be kept up, then the boom is justifiable; but when it is remembered that a number of mines may be forced to close down in a year's time, or to considerably reduce operations, one does not feel inclined to take part in the boom.

The excitement over State-aided re-patriation of the Chinese is cooling down, as it is seen that the vast majority of the coolies have decided not to go back. On some mines there is scarcely an application for re-patriation, while the largest number of applications on any one mine is 150. The first batch of re-patriates leaves shortly for China. After this no more will be able to go for several months, as there are no vessels sailing until next year. There should be peace now, so far as Chinese labor is concerned, until next year, when the elections begin.

The annual report of the Nigel Deep mine, in the Heidelberg district, shows how working costs mount up in this country, even with careful management, when the conditions are unfavorable. The working costs per ton crushed, for the past year, are as follows:

	s.	d.
Mining	25	10.113
Ore sorting and crushing	0	9.373
Ore transport	0	2.032
Milling expenses	3	10.253
Cyaniding sand	3	3.121
Cyaniding slime	1	1.460
General mining expenses	2	0.044
Mine office charges	1	5.511
Head office charges	0	7.016
London and Paris charges	0	6.765
Development redemption	7	4.312
Total cost per ton crushed	46	11.940

SUMMARY.

Value of yield	52	3.178
Working costs	46	11.940
Profit per ton	5	3.238

Thus the profit is about 20% of the yield. This mine has a battery of 30 stamps. The reef is very narrow, and only hand labor is used in the stopes.

The Bonanza mine is dying hard. It was supposed to be nearly finished months ago, but for July it managed to show a profit of £5,960. This mine has already exceeded the original estimate of its life by about two years—another proof that the estimates of the lives of the mines are conservative.——A novel scheme is recommended by E. J. Way, consulting engineer of the Rand Klipfontein mine, in the use of steel for shaft-timbering. He recommends steel instead of timber, on the following grounds: The cost of timbering works out at £6 per foot; steel works out at less than this; but taking them on an equal basis, if re-timbering had to be done twice in a life of 30 years, it would mean to this mine an extra cost of £48,000 besides the cost of delays, while steel suitably coated with an acid-resisting composition is considered to be good for the whole life of the mine.

London.

Another Mexican Exploration Company, Backed by Strong People.—Operations at Guanacevi and Tetela. — Splendid Returns From the Esperanza.—Oroville Dredging.—Cornish Tin.

From some particulars published today by Mexican Agency, Ltd., it would appear that the Agency intends to take a conspicuous part in opening up Mexico's national mineral deposits. The Agency itself has a capital of £350,000, of which £277,360 has been issued, and the remaining £72,640 is held in reserve. It operates under the influence and inspiration of the Esperanza and Camp Bird group. The managing directors of the company are Mr. A. M. Grenfell (chairman of Camp Bird, Ltd.), and Mr. J. S. P. Samborne (director of Esperanza, Ltd). The consulting engineer is Mr. R. J. Frecheville; the resident manager and the resident engineer in Mexico are respectively Mr. Richard H. Hutton and Mr. Louis Chevrillon. The Agency has acquired control of, or a large interest in, the Guanacevi Co., the Compania Minera de Mexico, and the Tetela Company. The Guanacevi properties comprise a large group of silver and gold mines in the camp of that name, as well as options on the extensions of the principal properties of the group. The most important mines are those of Santa Cruz, Aranena, San Vicente, and Mina de Agua; the other properties are old mines on what are said to be well-known veins, and will have to be cleaned out and re-opened before they can be properly examined. The sampling of the Santa Cruz orebodies has been thorough, and has been further confirmed by several mill-runs on large tonnage. It is estimated that the 120,000 tons of ore above mentioned should leave a minimum net profit of £90,000, reckoning silver at only 26¼d. per ounce. The Aranena mine, which immediately adjoins the Santa Cruz mill, is stated to have an ore-shoot opened up and developed for a length of 1,200 ft., and has been worked in former times from the surface to 75 ft. below the present adit-level. Below this "the vein is virgin and the values are good." So far, this mine has only been worked for high-grade ores, which were sorted out. The San Vicente mine has continuous old workings for about three-quarters of a mile, with an uninterrupted line of dumps which have been sampled and found to contain low-grade ore. The Mina de Agua is another old mine from which quantities of rich ore have been extracted. It covers the immediate extension of the well-known Predilecta mine, which is stated to have produced £230,000 in the last few years. The Tetela properties comprise 69 claims in the camp of Tetela (State of Puebla) and an option on a group of claims on the extension of the main mine. The principal mine is that of Espejeras, said to have been worked for several hundred years, having been an important gold producer. At Huimantla, State of Guerrero, the company owns certain properties, which comprise 112 claims in the mining camp of Taxco, said to be the most important producer of the State of Guerrero. The claims cover a number of veins on which numerous old mines have been found.

The ores are all lead and silver. The properties on the Rio Balsas, in the State of Guerrero, cover large deposits of copper-bearing iron pyrite, low grade on the surface. They are being prospected in depth to discover whether enrichment takes place, as is the case with similar deposits worked in the same State which have developed into important mines. Another group of properties in the camp of Talea (Oaxaca) comprises 100 claims with important silver-bearing veins, some of which have yielded ores of a very high grade. One vein of this group has an average width of 27 ft., which can be followed on a length of over a mile, and at many points on the croppings has yielded ore very much above pay on a large part of its width.

Esperanza (Mexico) stockholders who have sold lately to below £3 on bear rumors will feel rather sick on seeing the August report from the mine published this morning. It is worth reading:

The mill ran 29 days and crushed 15,257 tons of dry ore.			
Shipped to smelter	8,628 tons of dry ore.		
Estimated realizable value of bullion produced		$154,064	
Estimated realizable value of concentrate		79,500	
Estimated realizable value of ore shipped to smelter	634,252	$867,816	
Receipts from rents and other sources		420	
		$868,236	
Less working expenses, including development, marketing of bullion, freight and treatment charges on ore shipped to smelter		$327,840	
Allowance for depreciation of plant	2,500		
Consulting engineers' fees and New York office expenses	2,526	$332,866	
		$535,370 =	£109,707
Less London expenses of about			250
Estimated profit			£109,457

Of this there has been expended on construction account $2,383, and prospecting on Suceso property $3,203. Feet of development work, 1,313. The report goes on to say: "As the attention of the directors has been called by shareholders to various adverse rumors which have been circulated with regard to the mine, I am instructed to inform you that such rumors are entirely without foundation. The lowest developments of the rich orebody continue to open up high-grade ore, while in the territory north of the fault, the San Rafael vein is opening up in a most encouraging manner on the 7th level."

El Oro returns for August show a good average: Tons milled, 22,231; yield, $190,454; net profit, £17,591.

The latest news from Oroville Dredging, Ltd., is distinctly encouraging to English stockholders and American management. The net returns for the quarter, June, July, and August, are reported as approximately $150,000, while the operating costs are stated to be materially reduced during that period. The gross returns during this quarter as announced weekly having been $215,750, the operating cost works out at slightly over 30% thereof, and the net profit at the rate of over 17% per annum on the company's total capital with nine dredges only at work. It is announced that one of the three additional new dredges should be in operation before the end of the present month.

When capitalists and speculators return from the moors after their holiday they are promised a sheaf of prospectuses relating to Cornwall's hidden wealth, and the means to be employed by the use of their money to place some of these riches within their grasp. The last fortnightly black tin sale — 185 tons — shows a falling off in quantity, but the average price — £105 11s. 4d. — was an improvement of 14s. 7d. per ton on the previous 'ticketing.'

Butte, Montana.

September Output. — Division of Property in Settlement Between Former Litigants. — The Nipper Goes to the Red Metal Co. — Anaconda Gets the Belmont and Will Sink Deep Shaft. — Settlement Releases Much Rich Mineral Territory. — East Butte Cuts Two Good Veins. — Pittsburgh & Montana to Resume Smelting.

The September copper production of the Butte district was 29,456,520 lb., 4,600,514 lb. less than in August, the decrease being due to the fact that there were two working days less in September than in August, and that four big mines—the Minnie Healey of the Red Metal, the West Colusa of the Boston & Montana, the Mountain Con. of the Anaconda, and the Clear Grit of the Washoe Co.—were not in operation during September, having been closed for repairs. The output of the lessees on the East Butte Co.'s mines was also considerably reduced owing to the fact that many of them have been engaged in opening new ground.

The different companies which contributed to the September production, in ore and copper, are as follows:

Company.	Tons of Ore.	Pounds of Copper.
Boston & Montana	96,000	7,296,000
Anaconda	111,000	7,992,000
Butte & Boston	18,300	1,281,000
Washoe	16,800	1,159,200
Parrot	11,160	691,920
Trenton	15,900	1,113,000
North Butte	30,000	3,900,000
Red Metal	28,500	2,080,500
Original	29,100	2,153,400
East Butte	3,750	337,500
Pittsburgh & Montana	4,020	402,000
Miscellaneous	15,000	1,050,000
Total	379,530	29,456,520

The daily output of ore and the average yield per ton in copper were as follows:

Company.	Tons of Ore.	Pounds per Ton.
Boston & Montana	3,200	76
Anaconda	3,700	72
Butte & Boston	610	70
Washoe	560	69
Parrot	372	62
Trenton	530	70
North Butte	1,000	130
Red Metal	950	73
Original	970	74
East Butte	125	90
Pittsburgh & Montana	134	100
Miscellaneous	500	70
Total	12,651	

The stockholders of the Red Metal and various Amalgamated sub-companies have completed the division of properties and orebodies in the settlement of the old controversy between the Amalgamated and F. A. Heinze, the predecessor in interest of the Red Metal Co. The latter, which is the operating company for the Butte Coalition, has secured an immense amount of mineral territory as a result of the compromise settlement, and the value of the mines of that company has thereby been increased more than threefold, compared with the value when owned by Heinze and disputed by the Amalgamated. In getting the Nipper mine, one of the properties that had for years been tied up by litigation and injunction, the Red Metal gets in value in that property alone almost as much as all the operated properties of Heinze were worth at the time he sold out to the Butte Coalition. The Nipper has always, by both sides to the litigation, been conceded to be an immensely rich property. It lies north of the Parrot and northwest of the Anaconda mine. The point in dispute between the Amalgamated and Heinze was whether the Nipper mine owned the apex of the vein on which Heinze was mining, the Amalgamated claiming it did not and therefore had no extra-lateral rights and could not mine beyond

the side-lines of the Nipper. The contrary view is evidently held in the settlement with Red Metal, for the latter is conceded the right to mine on the so-called Nipper or Blue vein on its dip beyond the south side-line of the Nipper claim and under the Odin, Kanuck, Adventure, Micawber, and one of the Parrot claims, all properties of the Parrot Co., and also under the western portion of the Never Sweat mining claim owned by the Anaconda Co. Its limits are, however, confined to the underground territory described, and from that point the vein will hereafter belong to the Parrot Co., which also obtains possession of some rich orebodies as a result of the settlement. The Red Metal also is given a five-thirty-sixths interest in the Nipper claim, which the Anaconda Co. had owned, and it now owns the Nipper absolutely. Heinze used to consider the Nipper one of the best copper mines in the Butte district and said it was capable of producing 1,000 tons of ore daily. The Red Metal will now proceed to operate the Nipper on a large scale. Through an arrangement, in anticipation of the settlement, the Parrot Co. has for some time been mining a limited area for the Red Metal Co. and hoisting the ore through the Parrot shaft.

In its settlement with the Anaconda Co., the Red Metal Co. deeded to the Anaconda several lots in the East Butte district, upon which is situated the shaft of the Belmont mine, a former Heinze property. The Anaconda intends to enlarge the shaft and sink it to a depth of several thousand feet, and make it the main working shaft for the Anaconda mines, the southerly workings on the big Anaconda vein being near the Belmont shaft. The Red Metal owned an interest in the Dayton mine, which has been transferred to the Boston & Montana Co., and the latter in turn made a number of important concessions in settling the controversies over the orebodies of the Minnie Healey, Pennsylvania, Gambetta, Piccolo, and Colusa mines. The orebodies in these properties have been divided along certain planes and levels of the underground workings, to which the operations of each company will hereafter be confined. The settlement releases immense orebodies which for years had been tied up by injunction, and the Red Metal Co. thereby acquires a large mineral territory. The settlement between the Red Metal and Butte & Boston releases to the latter the veins in the Michael Davitt mine, while the Snohomish and Tramway mines, in which both companies own interests, will be operated jointly by the two, each sharing in the profits and expenditures in proportion to the interests owned in the property.

Since the Red Metal came into possession of the Heinze properties an immense amount of work has been done in repairing the properties, which had been worked hastily as the time approached for turning them over to the new company, and were left in a bad condition. In prosecuting the work new orebodies have been opened up in the Minnie Healey, Rarus, and Corra mines, and with the Nipper in commission again, the Red Metal will soon be in position to mine from 2,000 to 3,000 tons of ore daily.

The East Butte Mining Co. has cut two large veins in the 400-ft. cross-cut, one north of the shaft and the other to the south. The veins are two of those being worked by lessees between the 200-ft. level and the surface. At the 400 they are larger and richer, which appears to indicate persistence to greater depth. The cross-cut will be continued north and south through the entire width of the company's original ground, and at least twenty veins will be cut. The vein north of the shaft is about eight feet wide and carries four feet of first-class ore, the remainder being good concentrating stuff. The first class runs about 8 to 10% copper. The vein cut south of the shaft is larger, and much of the ore runs as high as 40% copper. The company will begin mining on its own account within a few weeks.

The Pittsburgh & Montana Co. is hoisting about 135 tons daily; it is the richest ore yet taken out of the Pittsmont ground, the average for August having been 6.15% copper. The mines are opened to a depth of 1,200 ft., but it is hoped that the best orebodies lie deeper, and a winze is being sunk from the 1,200 level. The company is also engaged in running a cross-cut north through the length of property. Three drifts are also being run on the veins. The Pittsburgh & Montana Co. is likely to begin remodeling its smelter soon, and resume treating its own ore. It has been estimated that the smelter can be re-built and made into a modern plant with the expenditure of an additional $50,000. It will be necessary to abandon some of the Baggaley appliances, which have proved so expensive to the company while the inventor was experimenting with them. Some of them have proved practical and will be retained. If the smelter is re-modeled the company will treat some custom ore, and will probably handle that of the East Butte Company.

Denver, Colorado.

Oldest Mines at Cripple Creek Still Productive.—Lack of Cheap Milling.—Saratoga Smelter Starts to Work.—The Discovery in Poughkeepsie Gulch.—Disaster to a Power-Plant.

The Gold King in Poverty gulch, Cripple Creek, was the first mine in the district to ship ore. The ore was actually struck in the Gold King, then called the Chance claim, in February, 1891, but the first shipment was made early in 1893. The mine is still shipping. About one carload per week of high-grade ore is marketed. This ore comes, very largely, from the 1,000-ft. level. In 1902 the cry was raised that the Cripple Creek mines were all surface pockets and that the camp was nearly worked out. The writer was one of the very few who contradicted this idea in print and the MINING AND SCIENTIFIC PRESS was one of the few technical journals that voiced the same ideas, so it is gratifying to notice the record of such mines and say, "I told you so." There are, of course, many others that are making heavy productions from even greater depths than the Gold King. Take the camp as a whole and it is doing nicely, but it needs two things very badly: One is a deeper drainage adit to facilitate the working of the (now well established) deep-seated ores, and it needs lower milling costs for its low-grade ores. It is remarkable that an American mining camp in an enterprising Western community should struggle along under a handicap which is unwarranted and burdensome. This is the more remarkable when it is considered that Cripple Creek men have gone abroad and overcome greater milling difficulties in other camps. Take Kalgoorlie, Western Australia, for instance. Robert J. Grant and H. A. Shipman, both of Cripple Creek, were the pioneers in reducing milling costs to a reasonable basis in that camp. Shipman and Grant got their milling costs down to about $3 per ton on telluride ores, and the working conditions at Kalgoorlie are less favorable to economical operation than they are at Cripple Creek. Still Cripple Creek cringes along in the shadow of the 'Trust' to the tune of about $7 per ton as a minimum rate on her low-grade tellurides.

Elmer E. Loring, manager of the Hoosier Creek Gold Mining Co., is about to unwater and prospect the lower workings of the famous old Hoosier mine, on Hoosier Pass, at the headwaters of the Blue river. This property is located on a large vein of low-grade stuff. The principal value is in gold. It is probable that a modern mill will be required to work the mine at a profit.

The old Saratoga smelter at Ironton has resumed

operations after a period of idleness of at least twelve years. For several years the late Charles Newman, of Durango, tried to interest capital in the enormous low-grade iron-gold orebodies near Ironton. Last year he died. Now his dream is being realized, but by others. Just as the grim and silent stacks of the old smelter seemed to brood like a disembodied spirit over the period of Ironton's neglect and desolation, so we can imagine the cheerful spirit of Charles Newman brooding over the newly born period of her activity and prosperity. The old smelter was unable to do what the modern smelter can do, and the old promoter failed at the task that younger and brighter men have carried through with ease.

Another old San Juan property to resume operations is the Neodesha in the Bachelor district. It has been leased by the Arps Bros., of Ouray, and almost at once, after taking hold, they began to ship ore. The regularity with which lessees begin to ship ore from old and neglected properties, almost as soon as they go to work, is remarkable.——The recent sensational strike of free gold ore in Poughkeepsie gulch above Ouray, in the San Juan range, continues to excite wide-spread interest. The gold values have been traced along the vein for 1½ miles. The first claim located on this vein was called the Free Gold and the whole vein is generally called by that name. Thomas Walsh, former owner of the Camp Bird, has been down to see it.

The recent disaster to the Rockwood Power Co. plant below Silverton may be studied with profit by owners of other power-plants. There was a small leak in the main delivery-pipe some 300 ft. above the power-house. This leak did not amount to anything at all so far as the loss of water was concerned, and it was neglected. The little jet of water issuing from this leak gradually undermined the supports of the pipe for a considerable distance and the pipe sagged and broke. The water liberated under pressure did great damage, washing a large amount of soil down on top of the power-house and undermining the pipe-line still further.

The annual report of the United States Reduction & Refining Co. for the year ended July 31 shows a surplus, after charges and preferred dividends, of $176,704, an increase of $115,336. Four quarterly dividends were paid on the preferred stock, aggregating $236,748. According to the report of the executive committee, the tonnage of ore produced in the Cripple Creek district during the year was greater than at any time since the labor troubles in 1903. The sale of the Utah Copper Co.'s stock was consummated after the close of the books for the last fiscal year. The initial plant which was erected for treating one of the tailing dumps at Colorado City, has continued to be successful and profitable. During the early part of the present fiscal year an experimental plant was erected and operated to determine if still further values could not be recovered from the tailing. These experiments were satisfactory and the directors authorized the construction of a tailing plant to treat 800 tons per day, including the daily discharge from the mill. This plant is rapidly nearing completion and will be finished in the latter part of October. At the time of the annual meeting in January, 1907, we hope to be able to give definite figures as to the results, which will enable the directors to decide as to the advisability of erecting a similar plant at Florence. The general balance sheet shows a net surplus of $1,620,209. Cash, accounts receivable, and advances on ore total $690,165.

Already Denver is preparing to welcome the American Mining Congress which meets here on October 16. There seems little doubt but that this meeting will be a great success and many representative mining men from all over the United States are coming to attend the Congress. Vice-president Fairbanks has just been entertained in Denver. The vice-president has an ingratiating way about him and has made a host of friends in this vicinity. He tells an audience that they have the finest city and State on earth and does it in such a trust-inspiring way that people forget that he said the very same thing in the last city and State he visited.

Toronto, Canada.

Preparing for Winter at Cobalt.—Another Strike in the Nipissing.—Other Discoveries of Rich Silver Ore.—Government Mining on the Timber Lands.—A New Recorder's Office.—Gold and Iron Ores at Steel River.—Asbestos Industry.—Head Bounties.

With the near approach of cold weather, which sets in earlier in New Ontario than in the southern portion of the Province, preparations are being made for the winter. Numerous new buildings are being put up and all arrangements made to permit work to continue without interruption. Production of ore has lately been steady, most of it being stored until the smelters in course of erection at Hamilton and Trout Lake are ready to handle it. The terms offered by the Copper Cliff smelter at Sudbury, Ontario, are hardly more satisfactory than those of the New Jersey smelter. While the Copper Cliff smelter pays at the rate of 50c. per lb. for the cobalt content of the ore, it only allows 90% for the silver, as against 95% paid by the New Jersey smelter, which allows nothing for cobalt. The quantity of ore packed ready for shipment at the leading mines amounts to about 20 carloads, mostly high-grade, running from 1,500 to 3,000 oz. per ton.

Another discovery has been made on the Nipissing property about 250 ft. south of the vein at Ledge 49—consist-of a vein 10 in. wide on the surface, which has been uncovered for a distance of 50 ft. and yields an assay of 50% silver. Should this vein prove to be a continuation of Ledge 49, as there is reason to suppose, the deposit will be an extremely valuable one. At the McKinley-Darragh-Savage mine a new vein has been struck in the 75-ft. cross-cut at No. 1 shaft, from 6 to 8 in. wide and carrying plate and leaf silver. No. 2 vein has been stripped for 400 ft., and is found to improve in value as it is followed downward, assays showing silver up to 3,000 oz. per ton. The Kerr Lake Mining Co. is working seven veins on its property, the ore overaging from $1,200 to $1,600 per ton. During August the shipments from this mine were over 60 tons, valued approximately at $90,000.

At the Ontario Government mine on the Gillies timber limit, the work of sinking the shaft is making steady progress under the direction of the Inspector of Mines, Mr. Corkill. It has been decided to conduct mining operations directly by the Government through the Bureau of Mines and not by contract, and it is intended to ship a carload of ore to the smelter this fall to raise money for the work instead of drawing upon Government funds, thus making the enterprise self-sustaining from the outset.

The Wabi Cobalt Mining Co. has made a strike on its location on Lot 11 in the fifth concession of Lorraine township, east of Cobalt. At a depth of 12 ft. in the shaft, a cavity about 8 ft. deep was discovered, the dirt in which was rich in native silver, assays of which, when panned out showed 13,410 oz. per ton.——The new recording office in Cobalt was opened last week, and is doing a big business in prospectors' licenses.

E. F. Beattie, of Bay City, Mich., president of the Argentenil Iron Mining & Milling Co., has secured a valuable gold, iron, and silver location at Steele river on Lake Superior, about 155 miles east of Port Arthur. The

gold and iron veins run parallel from the water's edge up a cliff 110 ft. high. The gold vein is claimed to be 100 ft. wide on the top of the cliff, and of unknown depth; the ore is arsenical pyrite carrying free gold and some silver. The iron is hematite, running about 50% iron. Analyses of two of the samples of gold ore give returns of $325 and $37.60 per ton. Mr. Beattie obtained information as to these deposits from a fisherman at Jackfish, who was told of them by an Indian.——The Golden Park Mining Co., of which J. W. Keenan is general manager, is preparing to begin extensive mining operations on the McPhail property near Dryden, Ont.——The Viking gold mine, Eagle Lake district, has been acquired by the Viking Gold Mining Co., the stock of which is largely held by Toledo, Ohio, capitalists who are resuming work on the property.

The Philip Carey Manufacturing Co., which has a large plant at Cincinnati for the manufacture of asbestos goods, is establishing a branch near Montreal, the object being to save the 25% duty on raw asbestos imposed by the American tariff.——The Canadian lead bounties have been suspended for some time, under the provision of the law that no bonus is to be paid when the price exceeds £16 10s. per ton. Advices received by the Trade & Commerce Department give the current market price of lead on the London market at £18 per ton, so that the bonus continues suspended.

Bisbee, Arizona.

An Important Transfer.—News From the Big Mines.—Fresh Discoveries of Ore in the Calumet & Pittsburg and Shattuck-Arizona.

Information has come from a reliable source that the details in connection with the turning over of the Warren Realty & Development Co. to the Cole interests are being arranged at Duluth, Minn., at the present time. The nature of the transfer seems to be that the property will come directly under the supervision of Thos. F. Cole, whereas formerly he took no active part in the management of this enterprise.

At the Copper Queen everything is about the same as usual. Progress is being made in the erection of the new machine-shops on the side of Sacramento hill, and a good wagon-road has just been completed, connecting the Gardiner and Lowell shafts. At the Calumet & Arizona smelter everything is running along smoothly, and the output will equal that of last month, namely, 4,600,000 lb. copper. An additional blower and engine have been contracted for, and will be delivered before the first of the year. The output of the Copper Queen smelter will also equal that of August. At the Superior & Pittsburg property the water in the Briggs and Hoatson shafts has increased materially during the week, but with the pumping facilities available, it will be an easy matter to take care of the increased flow. At the Briggs, ore of an excellent grade was encountered during the week, in the drift which is being driven from the C & P shaft to the Hoatson. A stringer of ore several feet in thickness was encountered during the early part of the week and it is still in evidence. At the Hoatson, a large quantity of ore is being hoisted, but on account of lack of facilities for loading railroad cars at this shaft, the ore is being placed temporarily on the dump. The management intends to start the construction of ore-bins this week, and as soon as they are completed shipping will probably begin from this shaft. Several high-grade orebodies were encountered in this shaft during the week, and the outlook is highly satisfactory.

At the Shattuck-Arizona, the new Allis-Chalmers hoist, which was ordered some months ago, arrived during the week, and is being hauled to the property. This plant will be installed and operating within the next three weeks, at which time the hoist borrowed from the Junction will be returned, and ore shipments materially increased. The Sullivan compressor will not be shipped until early in December. The two new 150-h.p. boilers have been placed in position, and as soon as the old ones can be re-arranged a new boiler-room will be constructed. The ore shipments have been averaging a little less than 200 tons per day, but it is expected that this will be increased to 300. On the 700-ft. level two new bodies of sulphide ore is being opened up, as well as one of oxidized material. On the 800 a new sulphide body was encountered on Wednesday. The drift on the 600 is in iron ore and lode-matter. Sinking of the shaft will be resumed this week and will be continued until the 900-ft. mark is reached; the shaft at the present time is down 800 ft. At the Denn-Arizona property, everything is going along about the same as usual. At the Cochise, the shaft is being sunk and the water is saturated with copper.

Cripple Creek, Colorado.

A Destructive Fire.—Successful Lessees.—A Patentee Wins His Suit Against the Portland.—The Gold Sovereign Highly Productive.—Sale of the Dillon Mine.—A Deep Shaft for the Dexter.

The entire surface plant of the Jerry Johnson Mining Co. on Ironclad hill was destroyed by fire the night of September 24. H. P. Dahl has this property under lease and he estimates the loss at about $10,000, with little or no insurance. The origin of the fire is not known. The compressor on this property supplied air to the Teutonic, W. P. H., Arapahoe, and Midway, and its being put out of business will materially affect these properties.——The Union Leasing Co., operating the Proper claim, Block 108 of the Stratton Estate, on Bull hill, has installed an electric hoist. Cross-cuts will be started from the bottom of the shaft, which is 100 ft. deep.——A small car of rich ore has been shipped by John Davis, leasing on the Doctor-Jack Pot mine on Raven hill. Work is being conducted through the Morning Glory shaft. The returns from this small lot ran 15 oz. per ton and another larger shipment is expected to be made shortly.——On the north end of the W. H. P. claim on Ironclad hill, Sorrenson and associated lessees have recently cut ore at a depth of 175 ft. Machinery is being installed, so as to be able to sink the shaft another 100-ft. lift and cut this orebody at a greater depth.

Not long ago F. Herrman brought suit against the Portland Gold Mining Co. for infringement of his patent rights. Herrman invented an ore-washing machine, which he claimed the Portland Co. had been using without his consent, and damages were awarded him. The Portland appealed the case to the Federal Court, but a new trial was denied.——Beebe & Large, operating the W. P. H. lease of the late United Gold Mines Co., are shipping good grade ore from the 400-ft. level, which is expected to run in the neighborhood of $50 per ton.——It is possible that when the Golden Cycle mill at Colorado City is in full working order, the output of the Gold Sovereign mine on Bull hill will be sent to that plant for treatment. This mine produces between 1,000 and 1,500 tons of ore per month, which is obtained from one of the largest ore-shoots in the district.——The first dividend of the year of half a cent per share, amounting to $12,000, has been declared by the Gold Dollar Mining Co., on Beacon hill. Payments will be made on October 15.

The Dillon property on Battle mountain, which was until lately under lease to Waters & Price, has been bought by the Granite Gold Mining Co., whose property adjoins the Dillon on the west. The sale price is in the neighborhood of $160,000. The Dillon Co. owns the Dillon and Amazett claims, which produced $87,000 in 1905. The main shaft is down 800 ft. and the Granite people

intend to sink it still further right away, as well as to do other development work.——Extensive development of the Dexter mine, situated on the east slope of Bull hill, and the Empire State, of the Isabella Gold Mining Co., on the north slope of the same hill, will shortly take place. W. E. Little and partners have these two mines under lease, and $80,000 has lately been raised among Eastern capitalists. It is proposed to sink the Dexter shaft several hundred feet, making it one of the deepest in the camp.

Negotiations are pending for the Golden Cycle mill to treat the ore from the Abe Lincoln mine of the Tunnel & Leasing Co. The ore of this mine is being stored awaiting results.——The Standard Leasing Co., operating on the South Burns property on Bull hill, has been getting some very good ore in the last few days. Stoping is being carried on at the 800-ft. level, west of the shaft on a vein five feet wide. Cross-cutting has also been going on for some time to catch the Findley vein, which was cut last week. Work on this vein has already begun and the output of the mine should materially increase from this source.——A. T. Holman, general superintendent of the Golden Cycle Mining & Milling Co., has resigned his position and Joseph Carr, foreman of the property has taken his place.

The Dollar Leasing Co. has been formed by Jesse Waters, J. J. Cogan and J. W. Price, to operate the Last Dollar mine on Bull hill, the articles of incorporation having been filed with the county clerk and recorder. The directors comprise, in addition to the above men, B. H. Hopkins and George F. Fry, and the company will be capitalized for $10,000, the shares having a par value of $1.——The Shurtloff mine on Bull hill, belonging to the Findley Mining Co., is to be started up again within the next few days. A large quantity of ore has been blocked out on both these properties; enough, it is said, to keep three shifts going for a year or more.——Ore is being mined and hoisted from the fifth, eighth and ninth levels on the Wild Horse mine, on Bull hill, by Cavanaugh & Co., lessees. The filling of the vats of the cyanide mill on the same property has begun, the ore being treated at the rate of 35 tons per day.

Salt Lake, Utah.

Shortage of Coal at the Smelters.—Dividends from Utah Mines.—Labor Supply at Ely.—Repairs to the Ontario Adit.—Stock Transactions.—The Output from Tintic.

A shortage of coal is seriously handicapping the operation of the smelters in the Salt Lake valley at the present time and the supply on hand is becoming so dangerously low that grave fears of a shut-down are entertained. This situation is said to be due to the physical inability of the railroads to handle the traffic with their present equipment; in other words, the transportation companies have not kept pace with the prosperous condition of the country and are short on rolling stock. It is almost impossible to get slack coal at all and the smelting companies are compelled to content themselves with whatever they can get. The big mill of the Consolidated Mercur Co. at Mercur exhausted its supply one day last week, and it was out of commission for a brief period. The diverting of cars to the beet fields of Utah and Idaho is one of the causes of the coal famine.

Twelve Utah mines paid dividends during the month of September; the list consists of the following: Mammoth, $20,000; Bullion Beck, $10,000; Carisa, $5,000; Grand Central, $15,000; Victoria, $10,000; Swansea, $5,000; Uncle Sam Con., $5,000; Utah (Fish Springs), $3,000; Silver King, $50,000; Consolidated Mercur, $25,000, and Daly-West, $108,000. The two last named made their regular quarterly distributions. The Sacramento Gold Mining Co. resumed payments on October 1 with $5,000.

There has been an exodus of laborers to Ely, Nevada, but an official of the American Smelting & Refining Co., which controls the Nevada Consolidated, states that it will be several months yet before the latter will do much construction and therefore the demand is well supplied. Now that the Nevada Northern railroad is completed, however, contracts will be awarded without delay for material and equipment for the new concentrating mill and smelter, the former to have a capacity of 5,000 tons of ore per day. Mr. Karl Eilers, member of the executive committee of the A. S. & R. Co., who had personal direction of the construction of the Garfield smelter here, has gone to New York to remain indefinitely and will supervise the letting of contracts for the Ely plants. The Ely Con. Copper Co. has been launched here to operate at Ely. Walter G. Filer is president and Willard F. Snyder, vice-president, both of Salt Lake.——The deal pending for a consolidation of the Silver Shield and United Bingham mines at Bingham has fallen through.——The Little Bell mine at Park City was closed last week.

Ore shipments from the Park City mines last week amounted to about 2,600 tons, the shippers and amounts being: Daly-Judge, 926; Silver King, 573; Daly-West, 625; Little Bell, 279; Ontario, 107; Keith-Kearns, 61; New York Bonanza, 18; Jupiter, 16. The new hoisting plant ordered for the Magnolia-St. Louis mine is being installed. The great task of re-opening the Ontario drainage adit, which caved in two years ago, is progressing and the main avenue will soon be tapped by the drift run around the portion that caved. To ensure safety a cement bulkhead has been put in at a distance from the portal of the adit of 14,000 ft. in a formation of solid rock. The bulkhead is 10 ft. long and 4 ft. high, and contains nearly fifty pipes, ranging in size from 2 to 4 in., each fitted with valves, so that the flow of water can be controlled as desired. The door to the bulkhead is a massive piece of iron, 3½ ft. wide, 4 ft. high, and 17 in. thick, weighing over two tons. It is swung on three hinges so adjusted that the door will be closed by an unusual flow of water.

The ore and bullion settlements reported by Salt Lake banks during September aggregated over $2,000,000, while the sales on the Salt Lake Stock & Mining Exchange during the same period amounted to 1,662,196 shares, for which $882,632 was paid.——The annual meeting of the New Stockton Mining Co., operating at Stockton, resulted in the retention of the board of directors elected a year ago. J. J. Trenam, of Salt Lake, is manager.

The ore shipments from the Tintic mining district last week were 123 carloads, the different mines contributing as follows: Beck Tunnel, 7; Bullion-Beck, 7; Carisa, 4; Centennial Eureka, 30; Dragon Iron, 9; Eagle & Blue Bell, 4; Eureka Hill, 7; Gemini, 4; Godiva, 2; Grand Central, 9; Lower Mammoth, 4; Mammoth, 15; Ridge & Valley, 2; May Day, 1; Scranton, 4; Swansea, 2; Uncle Sam Con., 4; Victoria, 6; Yankee Con., 2 carloads of ore.——The plant of the Utah Smelting Co., near Ogden, is practically completed and a contract has been made to bring power from Brigham City.——Walter C. Orem, manager of the Nevada Douglas Copper Co., operating near Yerington, Nevada, has returned after concluding a contract with the Truckee Electric Power Co., whereby the latter will supply the Douglas mine and proposed reduction works with electrical energy for a period of ten years. Mr. Orem will place contracts for heavy mine equipment. The Nevada Douglas appears to be a copper property of some magnitude, and the company has been strongly financed. The head office is in the Auerbach block, in Salt Lake City.

Mining Summary.

ALASKA.

The first men from the Chandlar strike report that the camp will probably be one of the best in Alaska. Joe McGuire and four other old-time Klondikers who arrived say 250 Koyukuk men have staked all the best creeks and will remain in the district this winter. Food has to be hauled over the ice, 150 miles from Yukon or Miles, or over snow from Coldfoot. Frank Howard, recorder from Koyukuk, has opened an office and is personally in charge of Chandlar camp. A man named McNett is the discoverer. The creeks carrying gold head from the high dome between the North and Middle forks of the Chandlar. The best known creeks are Squaw, Little Squaw, Rock, McMillan, and Big. Some flow into the North Fork and some into the Middle. ——Big and Squaw are the richest so far. Pay was found running from five cents to four dollars per pan. Stampeders are on the way from Rampart and other camps. Fifteen men from Rampart who arrived from Fort Yukon went up the Chandlar immediately in small boats. Supplies at Fort Yukon are limited and the prices twice those at Dawson.——McGuire and partners are emphatic that no one should go to the new camp without being prepared for winter.

ARIZONA.

The old and abandoned Queen mine, in Superior district, is to be re-opened and worked as soon as the new owners can get matters properly arranged. The new company at the head of the enterprise is composed of W. D. Fish, J. H. Thompson, J. W. Banbauer, Richard Fleming, and J. S. Towle, all of whom are Globe men. The company has incorporated under the name of the Queen Copper Mining Co. The authorized amount of capital is to be $5,000,000, divided into 5,000,000 shares at a par value of one dollar per share. The life of the company is to be 25 years, and its principal place of business is Superior, in Pinal county. —— The Pinkham mine at Chloride, in Mohave county, is producing more than a carload of ore daily.

COCHISE COUNTY.

Work has been commenced on the new railroad from Dragoon Summit to Johnson camp. The road will be five miles long. The Johnson Development Co., under the management of Kirk Hart, is sinking a double-compartment shaft. It is now down over 200 ft. The company uses a 25-h.p. gasoline hoist which gives satisfaction and has led others in the district to install them. At the Old Peabody, under the direction of H. J. Clifford, regular shipments are being made to the Copper Queen smelters at Douglas.

The Parks property, a group of four claims, has recently been bonded to Douglas Gray, of El Paso, and F. M. Hartman, of Tucson.——The Empire Co. is in 500 ft., and expects to make connections with the other workings within a short time.——The Arizona-Michigan Co. is down 100 ft. in its shaft.——The Arizona Consolidated, under the management of S. T. Entrekin, is making regular shipments to El Paso smelters.

The legality of the action of the Territorial Board of Equalization in raising the assessment on the mining property in Cochise county 400% is to be fought in the courts. The attorneys for the Copper Queen Co., with others, are getting data, and the matter will be brought to the attention of the courts at once. The case will be made a test one and will not apply to any particular mine, but will cover every patented mining claim in the country that was affected by the raise. The action of the Territorial Board last year was declared by the Supreme Court to be illegal, and the court will again have a chance to say whether the action this year was legal or not. The action of the Territorial Board this year was done in the manner prescribed by Attorney-General Clark as he interpreted the rulings made by the Supreme Court in its decision in the cases of last year.

YAVAPAI COUNTY.

(Special Correspondence).—Grading and excavating for the new mill to be erected on the Gold Leaf and Snowshoe mines, in the Cherry Creek district, is now finished, the machinery for the mill has been purchased and is now on its way to the camp. The power in the mill will be furnished by a Pelton water-wheel. The mill purchased is of the Lloyd patent grinding stamp pattern. There is an excellent showing of ore in the Gold Leaf mine. Work was discontinued in the mine lately on account of water, and it is the intention of the management to install a hoist and pumping plant as soon as the mill is completed and the work of sinking the shaft to a greater depth resumed.

Work is being pushed on El Capitan mine, in Kirkland district. The new shaft is now down 60 ft., where there is an excellent showing of ore. One of the two parallel locations covers a spring with a good supply of pure water, sufficient for the domestic uses at the company's camp, which is four miles south of Kirkland, on the S. F. P. & P., which can be easily reached by a good wagon-road.

Phœnix, September 28.

CALIFORNIA.

ELDORADO COUNTY.

The Standard Unit mill in Coloma canyon, near Garden Valley, has been started under the direction of John Moore. ——Work is to be resumed at La Graves mine, near Garden Valley.

NEVADA COUNTY.

E. B. Whitehead & Co. have bought 600 acres at Deadman's Flat, near Grass Valley, and propose sinking a two-compartment shaft to develop veins discovered by previous prospecting.

SIERRA COUNTY.

Miners' wages at the Sierra Butte mines at Sierra City have been raised to $3 per day, less 75c. for board, which is furnished by the company.——Good progress is being made in the construction of a 20-stamp mill at the Hayes Consolidated mine.——The adit of the South Fork gravel mine at Forest City is in 4,360 feet.

TUOLUMNE COUNTY.

(Special Correspondence).—The work of cleaning and retimbering the double-compartment shaft of the North Star mine is nearly finished. Within a few days work on the north drift at the 200-ft. level, which is 50 ft. long, will begin. The force is soon to be increased and three shifts will be worked instead of two as at present. A building to shelter the hoist will be erected.——The 5-stamp mill, hoist, and other machinery comprising the equipment of the Prudhomme mine have been moved to the Mary mine, the property of the Mountain Mining Co., situated two miles north of Tuolumne. W. A. Monroe, the superintendent, has developed the property satisfactorily and the outlook is said to be decidedly good.——Machinery to facilitate development work has been purchased by Glen & McKenney for their property on Knight's creek, in the Columbia district. ——Work preparatory to the erection of the 60-stamp mill to be built by the United Mines Corporation on its property near Tuolumne is progressing well. The grading required several weeks to complete. All is now about ready for the actual construction of the mill. In the group owned by the United Mines Corporation are the Grizzly, New Albany, Dead Horse, and Lady Washington mines.

Tuolumne, October 1.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Since the recent rise in the price of silver many mines which have lain idle for years are being re-opened.——Work has been started on the Sol Reynolds group on Griffith mountain, above Georgetown, by W. T. Nixon and partners of Denver.——W. C. Hood and F. A. Maxwell have resumed work in the Housborough adit to exploit more thoroughly their seven claims on Democrat mountain. Some good ore was shipped from this property in former years.——The Prudential Mining Co. is driving west on the two veins cut at 650 and 700 ft. respectively in the Prudential adit which enters the base of Republican mountain. The company is also driving the Montgomery-Ward adit, 2,000 ft. higher up the mountain on a line with the Prudential.——H. B. Clifford, of Denver, has purchased the Farwell water power at the Devils Gate

from W. E. Renshaw and is constructing a dam for storage purposes. He intends erecting a large concentrating mill for the treatment of lead-zinc ore. An expert from Rochester, N. Y., reported favorably on the Denver group on Payne's peak, East Argentine district, last week. The transfer deeds for the property are now being prepared. There are 37 mining claims in the group. The main adit is in 60 ft. and has already cut two of the veins. George W. Hubbard and partners are the vendors.——The St. Paul Mining & Tunnel Co. now has its St. Paul adit in nearly 1,000 ft. The breast is in a lode, which is believed to be an extension of the Equator vein of the Colorado Central mine. The next vein expected to be cut by the adit is the extension of the Colorado Central itself. About 1,000 ft. east of the adit these veins are producing largely and have a past production of $10,000,000 to their credit.——Work has been resumed on the Bernhardt group, which lies east of the St. Paul, between it and the Colorado Central, and through which ground the same veins run.——Cogshall & Co., owners of the group, are driving one of the lodes which shows a large body of mineralized quartz.——The Waukeegan Mining Co., operating claims on the main range near Loveland Pass, is putting in supplies for the winter and preparing to send in a large amount of ore now on the dump before snow blocks the trail. There is a vein of lead ore being opened up in the Josephine on Kelso mountain. A bridge 70 ft. long has lately been built across the creek to facilitate the transport of the ore.

Georgetown, September 28.

HINSDALE COUNTY.

(Special Correspondence).—R. J. Kilvert has a lease on the old Golden Fleece mine, but he is doing very little. It is his opinion that if the company owning the Fleece would expend a few thousand dollars on development, which a lessee is not in a position to do, the mine could be made to pay handsomely.——F. D. Goody has a lease on the Fleece dump and is treating the ore by cyanide. The precious metals occur in petzite, associated with pyrite and chalcopyrite. The plant is a small one, consisting of six 100-gal. tanks. The ore is given a double wash of lime as a preliminary treatment. Each vat is charged with a strong solution of cyanide first; after ten days it is washed with water and then discharged. The extraction is fair, considering the bad elements in the ore, which carries arsenic, antimony, and free sulphuric acid. The material treated is coarse, and this necessitates long treatment; if it were crushed fine and agitated, the process would require hours where it now consumes days. On account of the vats being in the open it is necessary to close down during the winter months.——The Pittsburg Metals Mining & Milling Co. is installing a hoisting plant near the top of the range above Henson creek.

The Hannah Mining & Milling Co., above Capitol City on Henson creek, completed its mill in July. It is now installing 4,200 ft. of 20 and 24-in. steel pipe, having a 400-ft. head of water for generating power. With the amount of water and present equipment it expects to generate 300 h.p., to supply its own property first with power and then to sell the surplus to neighboring properties. Temple electric drills and air drills are to be used for stoping. The mill was designed by F. W. Sherman, superintendent of the Daly-West mill, at Park City, Utah, and contains many of his original ideas. As designed, it has a capacity of 100 tons per day. G. H. Martin is president and manager of the company. W. R. Davey has charge of the installation of the power-plant.——G. D. Bardwell, operating the Yellow Medicine on the North Fork of Henson creek, has a contract with the Hannah Mining & Milling Co. to furnish it with not less than 700 tons nor more than 1,000 tons of ore per month while doing certain development work in the Oro. Bardwell is also shipping two cars per week of crude ore. The ore is valuable for copper and zinc. He is operating at present on the fourth level, which is 1,200 ft. long. He claims to have 20,000 tons of ore in sight in the mine.——Gustav Wilke, manager of the Planet Milling & Refining Co., is re-timbering the old raise from the cross-cut to the surface on the Red Rover property. The mine is being worked by lessees at present.

Lake City, Colo., September 25.

OURAY COUNTY.

Work on the new mill of the Camp Bird is being rushed as rapidly as possible. The tramway is again in commission after having been partially destroyed by fire and snowslides last spring. In order to ward against further damage by slides the Camp Bird Co. has erected a number of heavy cribs or fences a short distance apart near the top of the mountain where the slides start to run. In this manner manager W. J. Cox hopes to prevent the snow starting to slide as it is believed the fences will hold it. Last night a portion of the bunk and boarding house was destroyed by fire at the Revenue mine and mill. The fire burned off the roof, but superintendent E. A. Krisher and men saved the bake shop and dining room. About 160 men are employed at present on the Revenue.——The Atlas Mining & Milling Co., of which Fred Carroll is general manager and J. P. Sidwell of Chicago, president, expects to have the 10-stamp mill running in the next 30 days. They are waiting on material for the aerial tramway. Some is on the road and expected to arrive at any time. As soon as received work will be rushed on the tramway. The mine of this company is located in Sidney basin about one mile above the Revenue mill in Sneffels district. The mill contains 10 stamps but the company expects to increase to 30 stamps. A large amount of development work has been done on the property at the surface but it was decided to be a more feasible scheme to drive a cross-cut tunnel to tap the veins at a greater depth and upraise to the surface which is now being done. The tunnel is in something like 2,100 ft. and has crossed two veins. The first vein encountered is known as the Crown Point on which over 500 ft. of development work has been done. The ore from this vein carries considerable free gold. The other vein tapped by the tunnel shows good values in lead, silver, gold, and some copper. Work in the mine is being done by the Temple electric air-drill, which manager Carroll as well as the men operating the drill says is doing excellent work. Power is furnished by the Telluride Power Co., wires being brought over from the Telluride side.

Ouray, Colo., September 22.

SAN JUAN COUNTY.

(Special Correspondence).—Richard Whinnerah has a contract for driving the Bagley tunnel of the Frisco Mining Co. a distance of 5,000 ft. He now has 1,750 ft. of tunnel completed. It is expected this tunnel will tap the Sewell and Red Cloud veins. Sixteen hundred feet from the portal one vein was encountered which carries some values. Preparations are being made to equip with electric power which will be furnished by the Animas Power Co. at Rockwood. The accident to the power plant at Rockwood was rather serious but they immediately made arrangements with the Silver Lake Co. to use the power from the Silver Lake plant above Silverton and within 48 hours were supplying their customers with the necessary power. In no other part of Colorado is electric power used as universally as it is through the San Juan country.

Animas Forks, Colo., September 22.

SAN MIGUEL COUNTY.

(Special Correspondence).—It is not uncommon throughout this part of Colorado to see a sign 'Men Wanted' hanging on the office-door; in fact, there is a scarcity of all classes of help.——The Tomboy has about completed installing new mortars in its mill.——The ore now being brought down from the Smuggler mines is the best in years and the outlook for both the lessee and the company is most encouraging. The extraction obtained in the new mill of the Smuggler Union Co. since the institution of the Pierce amalgamators is much better than before.——The Black Bear in Bridal basin is undergoing extensive development, and a new mill is being erected on the property. L. Kaanta is president of the company.

The most important work being done on the Liberty Bell mine is a raise to connect with the Stillwell cross-cut. When this connection is completed it will enable the company to work the ground opened up by the cross-cut, which is 1,000 ft. on the vein. This company has been having some trouble of late with ore thieves. One party confessed

to petty larceny, as the amount of ore found on him was less than $20; another one is out on bail. Portions of the mine contain some very high-grade gold ore. C. A. Chase is superintendent; E. W. Nutter, assistant superintendent, and W. E. Tracy, mill superintendent.

Telluride, September 19.

(Special Correspondence).—Tyndel Rynard, general manager of the Vanadium Alloys Co., is increasing the capacity of his plant for handling the vanadium ore from his district. The plant now has a daily capacity of 25 tons. This is said to be the first plant of its kind in the country for handling this class of ore. The product from the mill is shipped to Niagara Falls.

Newmire, September 20.

IDAHO.

ELMORE COUNTY.

The Bagdad-Chase Mining Co., of Rochester, N. Y., has bought the Pettit mine at Atlanta for $150,000, and it is said that a $50,000 plant will be installed the coming winter. The mine is a lead-silver-zinc proposition.

IDAHO COUNTY.

Work has been resumed at the Fairview mine, at Roosevelt, by M. E. Eby. —— Superintendent Trewek expects to have the Sunnyside cyanide plant finished before winter.

NEZ PERCE COUNTY.

George S. Bailey, manager of the Ozark and Wild Rose gold mines at Pierce City, reports that on the Wild Rose they have a 10-ton roller mill and a 20-ton cyanide plant, and are negotiating for stamp-mills for both mines and also a cyanide plant to treat all the tailing. There are 2,500 ft. of drifts on the Ozark, and from a large station on the 110-ft. level they have commenced to sink a shaft 500 ft. in depth. The Wild Rose is two miles east of the Ozark. This is the ground originally owned by Dunn brothers of Wallace, Idaho. They extracted from $50,000 to $60,000 with a two-stamp mill, and the greatest depth attained was 40 ft. It is the intention of the Ozark Co. to drive a cross-cut tunnel 1,280 ft. in length to cut the present workings on the Ozark at a depth of 587 ft. At the 110-ft. level there is a 31-ft. lead, carrying a rich pay-streak on the foot-wall four feet wide, which is now being mined and milled. They are preparing the ground for square setting, so as to mine and reduce lower grade ore as soon as larger mills are erected. As soon as its 1,280-ft. tunnel is completed, the company will move all plants and camps to that point.——M. H. Hare recently purchased the Gaffney placers at Pierce City and is operating a dredging machine successfully, handling from 1,200 to 1,500 yards daily.——The Santiago and Fleetwood claims have been bought by Spokane people. They have a large force at work and have started up their two-stamp prospecting mill.

SHOSHONE COUNTY.

John H. Nordquist proposes starting a 1,000-ft. cross-cut to test, at a depth of 550 ft., the lode of the newly incorporated Lucky Calumet Co., of Wallace. It is thought that the nine claims of the company cover the extension of the Snowstorm ledge.——In consequence of a bond taken on the Ambergris mine by Mayor Rossi, A. Page, and A. Devlin of Wardner, the 90-ft. shaft is to be sunk 200 ft. deeper and 200 ft. of drifts are to be run.——A new hoist and pump are to be put in. At the Page Mining Co.'s property, west of Government gulch below Wardner, the three-compartment shaft is down 54 ft. and a contract has been let to put it down to the 250-ft. level. A cross-cut is to be started. Bunk and boarding houses have been completed. A boiler, hoist, and pump, are now on the ground. W. Clayton Miller, general manager of the Federal Co., is consulting mining engineer for the Page Co.——The Hunter Creek Co., which owns two claims adjoining the Hunter and Little Chief mines, at Mullan, has resumed work under the direction of H. F. Samuels. A 200-ft. extension of the present adit on the Belmont is being driven; it is now in 350 ft.——The Monitor Co. is shipping ore. Everything is being put into shape to enable continuous operation this winter. Timbers sufficient to deepen the shaft 200 ft. are being framed and a contract has been let for 300 cords of wood and a large quantity of lagging and other mine timbers. The main shaft is down 340 ft. and the drift on the 200-ft. level, now 130 ft. from the shaft, continues to show high-grade ore.——In the Stevens Peak copper belt, the Champion mine is opened by an adit in 625 ft., with a depth at the face of 225 ft.——It will be continued to get under a blowout of ore 150 ft. ahead of the present workings. Adam O'Donnell, the manager, has shipped 800 ft. of air-pipe, a fan, and sufficient supplies of all kinds to permit of work being continued all winter.

A concentrator is to be put in at the Tamarack & Chesapeake mine near Wallace, during the spring of 1907. E. R. Day is manager. Shipping is to be started as soon as the mine has been re-timbered.

Judge Beatty, sitting in the Federal Court at Boise, has declined to entertain a motion for an injunction to enjoin the Federal Mining Co. from dumping its tailing, announcing that such an order would tie up the mines and throw hundreds of men out of work. This leaves the question of damages the sole issue in the proceedings instituted by Brown and others against the Federal company.

Peter Bernier, president and manager of the Black Bear Fraction Co., near Gem, has purchased a five-drill compressor and one 75-h.p. motor, which will be installed and in working order about November 1. A second adit has been started 115 ft. higher than the railroad track; it will be 2,300 ft. long when completed. Nearly 300 ft. have been driven by hand, and the remaining 2,000 will be run by the compressor. Arrangements are being completed with the Washington Water Power Co. to furnish power for the motors.

WASHINGTON COUNTY.

The National Copper Mines Co. has 18 claims near Cuprum. Development work has been going on since May, 1905, by W. Trevor. The company is waiting for cheaper transportation before shipping.

The Goodenough Mining Co. is putting a five-stamp experimental mill at Marshall lake, near Council.

MONTANA.

FERGUS COUNTY.

Title to the $3,000,000 Kendall mine near Kendall, is disputed in a suit filed in the District Court at Helena by E. H. Bragg and I. I. Nelson of Cincinnati, O., against John A. Finch, A. B. Campbell of Spokane, and Henry Wick and the Kendall Gold Mining Co. The plaintiffs claim to have an option on an undivided half-interest, dating 1901, but that in the last year an interest has been sold to Henry Wicks without the knowledge of the complainants, who now ask for an injunction staying further operations at the mine; also for the delivery of the option.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—Free gold has been struck at Newberry mountain, 18 miles southeast of Searchlight, by John Thurman and Charles Hamill. The new district is five miles from the Colorado river. —— The Black Hawk, Venus, and Mountain El Dorado companies in El Dorado canyon have been consolidated into the Black Hawk Con. Mining Co. —— Thomas Gahagan has bonded the Belle group, adjoining the Venus on the south, for $25,000. The group consists of four full claims, with five parallel veins traversing the entire length of the property. —— E. J. Roberts, as superintendent, has resumed development work on the El Dorado Nevada, and with the installation of machinery, sinking will be resumed. Another shaft will be sunk on the Captain claim to water-level.——The El Dorado Sphinx Mining Co. is running an adit on the Silver Sphinx claim to reach the vein on the Combination Mines Co., that extends through its property. A. J. Peak, who is superintendent, has men building a new wagon-road from Nob hill, two miles distant. —— The Cyrus Noble mill has resumed and enough water has been secured to run three shifts. The mine is being developed to the 500-ft. level, and enough ore has been blocked out from the 300 to the 400-ft. level to run the mill, three shifts, for six months. —— The Duplex Extension Co. has let a contract to sink a 5½ by 11 ft. double-compartment shaft to water-level. The shaft will be sunk on the Eucher claim, with cross-cuts at each level

Superintendent Essenderft has ordered machinery. —— Ore has been found on the Wyoming Searchlight Co.'s estate, west of Searchlight.——The cyanide plant of the Searchlight Mining & Milling Co. will be in running order in three weeks.——The American Mines & Securities Co., of Denver, is operating the Fortuna group in El Dorado canyon, formerly the property of Jacob Stoner. A. McKnight is in charge of the development and has 24 miners at work. The company has a bond on the adjoining group of five claims belonging to the American Development Co. —— C. E. L. Gresh has purchased a concentrating plant for the Black Hawk Con. Mining Co. The company has a 10-stamp mill on the ground at the present time about to be erected, and will also have concentrators to treat the sulphide ore.

Searchlight, September 28.

(Special Correspondence).—The pleasant cool weather has caused a noticeable increase in the number of new arrivals here. The Utah & Nevada Stage Co. has had to put on extra stages and can now handle 70 passengers per day both ways, and is fully capable of handling the traffic until the railroad reaches here. The road is being rapidly built into Searchlight, the grade being completed within ten miles of the town. The Manville & Searchlight stage line, connecting with the Santa Fe railroad, is also equipped to handle a large number of passengers. It is a fortunate thing for the Searchlight district that—unlike many of the northern camps—the hotel and restaurant accommodations are ample.——Sinking has been resumed in the Cyrus Noble Extension shaft, the timbering having been completed. This property is located between the Cyrus Noble and the Parallel, and it seems likely that the mine with depth will equal its neighbor, similar ore having already been encountered.——In the Quartette, a cross-cut is being driven into the foot-wall of the Drake shaft at water-level, 250 ft. The ground was prospected prior to resuming sinking, there being some delay in securing a desirable pump. Drifts are being pushed on the 800-ft. level and, though no cross-cutting is being done, the indications are that the orebody will equal that of the level above.——The Boulder Mining Co. has let a contract for 100 ft. of development. The main shaft is down 200 ft. and will be sunk 40 ft. farther.——The Sunrise group of 12 claims, three miles east of the Quartette, has been bonded to G. W. Huntington and associates. The claims were the first located in this new part of the district and the indications are exceptionally good.——The Searchlight-Wyoming Co. has installed a 25-h.p. hoist and has resumed sinking from the 200-ft. level. The showing is very promising.——Operations will be commenced on the Gold Dyke Mining Co.'s property within the next 30 days. They will sink to the 500-ft. level from the present shaft (103 ft. deep) which has a 60-ft. cross-cut exposing 20 ft. of high-grade ore. The Gold Dyke promises to be one of the large mines of the Searchlight district. This property immediately adjoins the Pompeii on the west and the Blossom on the north.

Searchlight, September 15.

LYON COUNTY.

Twenty-three locators have staked ground in the new camp of Arrowhead, near Yerington. The Kockel brothers have nine veins on their ground. Some of them show ore going from $60 to $70 per ton. John McEwin has a good prospect and Charles McNeil has a claim from which fine pannings are obtained. The Kockel brothers have over 10 tons of ore on the dump and are arranging to make a mill test.

WHITE PINE COUNTY.

The completion of the Nevada Northern railway between Ely and Cobre, on the main line of the Union Pacific, was marked by a big celebration at Ely on September 29. This road will open up the wonderful copper deposits of this region.

OREGON.

BAKER COUNTY.

Oscar Eckstein and Wilfred Fralic have devised a method of treating black sand and intend erecting a reduction plant on the Snake river, near Huntington.

The Golconda mine, near Bourne, has been closed temporarily

MALHEUR COUNTY.

For a number of years natural gas, in limited quantity, has been known to exist at Ontario. A well drilled at the Boyer place, at the south end of town, furnishes sufficient gas for lighting, cooking, and heating. David Wilson, of Spokane, owner of the townsite of Ontario, together with J. R. Blackesly, H. C. Boyer, W. E. Lees, and Ward Canfield, have organized the Ontario Co-operative Gas & Oil Co. It is their intention to secure 25,000 acres, under 25 years lease, surrounding Ontario. Ontario is on the Oregon Short Line railway, in eastern Oregon, 40 miles east of Huntington and 60 miles west of Boise City, at the junction of the Malheur river with the Snake river.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Dominion Copper Co., of Boundary Falls, B. C., has bonded from the Reservation Mining & Milling Co. the Lone Star and Washington claims, near Danville, and several other claims are being negotiated for by the former company. Ten men are sinking a shaft and raising to it from an adit on the Lone Star. ——The annual assessment work on the Faithful-Surprise claims was recently finished. The Surprise tunnel, during the work, ran into a fine body of rich ore.——One shift of men is employed in making a connection between the No. 3 adit and the No. 2 adit workings in the Belcher mine. Owing to the blower having been removed from the No. 3 adit, the air is bad.——The Oversight Mining & Milling Co. is prepared to make regular shipments of ore from the Oversight claim and is making contracts for the haulage to the Belcher Mountain railway as soon as the laying of the track is finished.——The installation of the compressor plant at the Minnehaha mine has been completed, and the new tunnel has been started.

Danville, October 1.

Ira J. Hallensbe, of the Indiana Consolidated Smelting Co., and the Silver Creek Mining & Milling Co., at Keller, on the south half of the Colville Indian Reservation, states that this smelter is of 150 tons daily capacity, and will reduce copper and lead ores.

BRITISH COLUMBIA.

KOOTENAY DISTRICT.

It is reported that the 1,400-ft. level of the St. Eugene, at Moyie, East Kootenay, is looking well, as new shoots of ore have been uncovered there, and they are known to be as wide as the drift. Stoping will determine how much wider they are. Besides this an important shoot has been found on the 1,900-ft. level.

MEXICO.

SONORA.

After having cleared the mine of water, the Greene Gold Co. has decided to abandon the present system of operating and install dredges on its placer properties at La Brisca. When it opened up the placer beds at La Brisca the company installed a system of aerial tramways to convey the dirt to the sluices after it was removed from the workings by the machinery especially constructed for that purpose. The property had just been placed on a producing basis when the rainy season set in last year. The rainfall was so heavy and continuous that the pumping plant, which has a capacity of 3,000,000 gal., was unable to handle the water which flowed into the workings and it was necessary to suspend operations.

MEXICO.

The Mexican Light & Power Co., of Montreal, Canada, at its annual meeting, announced the intention to expand its operations. By September 15 it will have, ready for use, six turbines of 8,200 h.p. each, operating six 5,000 k.w. generators. The transmission lines run to Mexico City and to El Oro; it is intended to extend the wires to all the important towns in the Federal District. The company has secured comprehensive water rights on the Necaxa and Tenango rivers. The earnings for the first six months of 1906 amounted to $1,754,833 pesos, as against 752,330 pesos for operating expenses. It is estimated that the net earnings next year will be $157,000 gold.

Personal.

A. B. CALL is at Grant's Pass, Oregon.

T. BRUCE MARRIOTT is in the Argentine.

BEN B. LAWRENCE has been to Salt Lake.

FORBES RICKARD is at Searchlight, Nevada.

GEORNE W. MAYNARD is at Tucson, Arizona.

ARTHUR WINSLOW has returned to Boston from Europe.

W. J. ELMENDORF, of Spokane, is examining mines in Alaska.

ARTHUR L. WALKER is expected at San Francisco on October 12.

JOHN W. Z. Earle has returned from Mexico to Patagonia, Arizona.

JAMES F. KEMP sailed for New York from Vera Cruz on the *Seguranca*.

R. L. LLOYD is now with the Teziutlan Copper Co., at Teziutlan, Mexico.

HENRY F. MACKAY is superintendent of the Llanos de Oro mine, in Sonora.

EDGAR A. COLLINS, who was married recently, visited San Francisco last week.

E. B. LICHTENBERG has left London to go to the Gold Coast Colony, West Africa.

J. W. MERCER has returned from a summer tour in Europe and is now in New York.

FERDINAND SUSTERSIC, manager for the Amparo Mining Co., was at Mexico City recently.

J. PARKE CHANNING and C. L. CONANT, of New York, have been at Butte during the week.

NOEL GRIFFIN has gone to Egypt on his appointment as manager of the Nile Valley Company.

BANDMANN & ADAMS have moved to permanent offices in the Monadnock Bdg., San Francisco.

W. A. HOEING has been appointed manager for the Compania Minera de Tetela, in Puebla, Mexico.

FRED. G. FARISH has just returned from a three months' trip into Mexico and is now at Helena, Montana.

F. L. BOSQUI is designing mills for the Montana-Tonopah Co. and the Tonopah Exploration Co., of Nevada.

HARRY H. WEBB is in San Francisco, on a visit from South Africa. He will proceed to Mexico shortly.

THEODORE J. HOOVER, who is in London, is to be manager for the company owning the Cattermole process.

THOS. M. HUGHES has resigned as superintendent of the Creston mines, in the Hostotipaquillo district, Mexico.

T. W. E. DAVID, professor of geology in Sydney University, returned to Australia on the *Sonoma*, sailing on October 4.

HARRY INGERSOLL has been appointed superintendent of the San Francisco mine, in the Taviche district of Oaxaca, Mexico.

FRANCIS A. THOMSON has been appointed professor of mining and metallurgy in the Washington State College, at Pullman.

W. H. STAVER, assistant manager for the South American Development Co., is examining properties at Inde, Durango, Mexico.

Obituary.

P. J. GROSS died at Placerville, California, on September 27, from the effects of paralysis. He had been operating El Dorado mines since 1865.

PHILIP FERDINAND KOBBE, director and assistant secretary of the Westinghouse Electric & Mfg. Co., died at his summer home at Stockbridge, Mass., on September 21, aged 64 years. Mr. Kobbe was one of the pioneers in the electrical business, his efforts always having been devoted to the financial end. In 1883 he was elected treasurer of the United States Electric Lighting Co., which position he held until 1890, when the United States Electric Lighting Co. was absorbed by the Westinghouse Electric & Mfg. Co., at which time Mr. Kobbe was made treasurer of the latter company. In 1896 Mr. Kobbe was made vice-president in addition to his duties as treasurer, and in 1902 he became a director of the company. It was in the year 1900, when Mr. Kobbe was on his way to Europe to undertake important work in connection with Mr. Westinghouse's foreign interests, that he was stricken by an attack of paralysis, from which it is believed he never fully recovered. Mr. Kobbe was born in New York, October 24, 1842, and received his education in Germany. He was a man of broad culture and of a charming personality that endeared him to all of his associates, so that they were always glad to consider him their friend. He served in the Civil War as a member of the Seventh Regiment. Surviving him are a widow, three daughters, and two sons. Two brothers, Gen. William A. Kobbe, U. S. A., and Gustave Kobbe, author and journalist, of New York City, also survive.

In the passing away of Mr. Kobbe the interests with which he was so long associated lose one who throughout his career has been the embodiment of industry and honor.

Dividends.

On October 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 109 of $180,000. This makes the total paid since January 1, 1906, $1,800,000 and to date, $7,326,000.

Esperanza, Ltd., of El Oro, Mexico, and London, has declared a regular quarterly dividend of 12½ cents and an additional dividend of $2.50, payable on October 22.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, October 3.

Con. Virginia	$0.83	Manhattan Con	$0.84
Ophir	2.62	Jumping Jack	0.56
Savage	1.12	Midway	2.15
Tonopah Ex	5.30	Montana	2.92
Belmont	6.05	Mohawk	4.10
Jim Butler	1.33	Silver Pick	0.86
Jumbo	1.45	Sandstorm	0.68

METAL PRICES.

By wire from New York.

	Average Prices for September.	Closing Prices October 4.
Copper—Lake (cents per lb)	19.182@19.432	20 @20.30
" Electrolytic "	18.906@19.159	19.55@19.95
" Casting "	18.68 @18.89	19⅜ @19¾
Lead "	5.75	5.75
Spelter "	6.198@ 6.283	6.18@ 6.20
Silver (cents per oz.)	67.927	68¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	September 27. £ s. d.	October 4. £ s. d.
Camp Bird	1 6 6	1 7 0
El Oro	1 8 9	1 8 1½
Esperanza	3 8 0	3 3 0
Dolores	1 15 0	1 15 0
Oroville Dredging	0 19 9	1 1 3
Stratton's Independence	0 4 0	0 4 0
Tomboy	1 8 9	1 8 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Sept. 27.	Oct. 4.
Bingham Central	2¾	2⅞
Boston Copper	32½	31⅜
Calumet & Arizona	16½	16½
Cumberland Ely	10¼	12⅞
Dolores	8⅝	8⅝
El Rayo	7	6⅞
Guanajuato Con	4⅞	5
Giroux Con	10⅜	13⅜
Greene Con	26⅜	27¼
Nevada Con	19⅛	19
Nipissing	20⅛	23
Tennessee Copper	43¾	43
Tonopah Ex	5⅜	5⅛
Tonopah-Belmont	5⅞	5¾
Tonopah	18¾	18⅝
United Copper	66½	65⅝
Utah Copper	27¾	32⅞

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE mining district making the largest output of platinum is South Verchotursky in the Ural mountains, separating Europe from Asia. In 1905 the yield was 124,375 oz., as compared with 124,563 oz. the year before.

THE size and shape of a shovel make a marked difference in the efficiency of a workman. A small round-pointed shovel must be used in tough soils, but only large, square-pointed scoops should be used in handling earth off boards or in shoveling sand, unless it be to cast it some distance.

IN California, preliminary location work is not required. The locator has one year from the first day of January next succeeding the date of his location, to perform the $100 worth of work required by the Federal law. No work need be done during the period preceding this, in this State.

THE ordinary gait of average buggy horses is 9 miles per hour, 14 miles being a maximum. Seven miles an hour is a fair pace for a horse when ridden. A horse will walk from 3 to 4 miles per hour. A freight camel goes 2 to 2½ miles and a trotting camel 7 to 7½ miles per hour, accomplishing 100 miles without rest.

NO less than 77 vessels of a length of 500 ft. or more have been ordered since 1904 for the freight trade on the Great Lakes. The average cargo is 9,000 tons, and some of these boats carry 12,000 tons of iron ore apiece. They possess nearly three times the capacity of the vessels engaged in this trade ten years ago.

WHERE inside amalgamation cannot be successfully carried on inside a Huntington, Bryan, Kinkead, Chile, or other rotary mill, outside plates properly disposed will be found efficient. There are many instances where amalgamation inside a stamp battery is not satisfactory, and in other cases amalgamation is accomplished by preference on outside plates.

THE amount of money paid respectively, for labor and for supplies, in the operation of mines in the United States, is in the ratio of 62 to 38. At the Esperanza mine in Mexico it is 58 to 42. The tendency during recent years is to lower the percentage cost of labor in mining operations by the substitution of machinery and automatic devices wherever possible.

THE wolframite occurring in the quartzite overlying the gold-bearing conglomerate at Lead City, South Dakota, was first recognized by an amateur mineral collector, who was a teacher in the high school at Lead. He properly determined the black granular ore to be wolframite. Miners had for 20 years thrown it away thinking it only an ordinary iron ore.

WHERE gold can still be recovered from the lower part of the lowest plate of a series of apron plates in a stamp-mill it is usually good business to put in additional plate surface. If there is no room for this addition inside the mill building then the plates may be placed in a separate building, where it may be convenient, but preferably wherever the pulp will flow to it by gravity.

PURE WATER at a high temperature is a solvent for many mineral substances. The silicates composing soft glass are rapidly attacked by water at a temperature exceeding 185° C., and at 180° zeolites can be readily dissolved in pure water, the mineral crystallizing out on cooling. At higher temperatures many natural silicates are soluble, and this fact is, without doubt, of importance in the formation of mineral veins.

CONCRETE should be mixed as near the point of use as possible, and a long trip in a wheelbarrow is to be avoided. When it must be handled by wheelbarrow, it is best to dump the concrete on a small platform and shovel it over, before putting it in place care should be taken that all parts are equally wet; otherwise some portions of the work may dry before others, and thus cause cracks.

THE largest shipment of specie ever brought to this country arrived on the Cunard steamer *Carmania*, reaching New York on September 19. She brought $10,328,500 in gold coin and bars. The precious metal on the Cunarder was in 275 boxes, each box containing from 250 to 350 lb. of gold. During the voyage the gold was placed in the specie room on the main deck, guarded night and day by three armed men, each trio being relieved every six hours.

IN some mills where the ore is free-milling, there is still found 20 to 25% of the gold in the tailing after passing the plates. In some instances the saving may be increased by addition of more plate surface. In others if the plates already in the mill are kept in the best condition no additional plates will be necessary. A careful millman will not allow sand to bank up on his plates, nor permit bronze-colored spots to remain untouched long. Neither the space covered with sand nor the discolored spot will catch a particle of gold.

IN ORDER to prevent a forfeiture for failure to perform the assessment work required by law, the claimant must resume work in good faith and prosecute the same continuously without unreasonable interruption until the full amount of labor is performed; that is, one year's delinquency must be made up. Under the circumstances stated in the inquiry, after the performance of $100 worth of work in the manner suggested therein, the claim would not be subject to re-location until the first day of January following the completion of the work.

IF A buys a mining claim from B in June, 1902, the last payment becoming due six months later; and if A has the claim patented in B's name before the last payment is due and the receiver's receipt is issued by the U. S. Land Office in favor of B; and if A then makes his last payment and gets a warranty deed from B, both deed and receipt being recorded; and if one year later the Government patent is issued in B's name, then, although the patent is dated later than the deed, A need *not* secure an additional quit claim deed from B to make title good in A's name.

THE date of the discovery of iron has long been a matter of controversy; and it is generally believed that the iron first used by man was of meteoric origin. In support of this view Otto Vogel has given quotations from the earliest Finnish poem; and Sir Henry Bessemer in 1895 adduced evidence to show that the tools used in the construction of the Pyramids must have been made of a meteoric nickel-iron alloy. The theory is, however, open to considerable doubt, in view of the difficulty of working meteoric iron. Indeed, many authorities have denied that meteoric iron is malleable. The hypothesis is, nevertheless, an attractive one. Blocks of meteoric iron, though not very numerous, have been found in all parts of the world.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Who Is a Mining Engineer?

The Editor:

Sir—The plea of 'Viator' in your No. 2,402 for a legal definition of 'Who is a mining engineer?' is answered by the common estimate of the values of the titles attorney-at-law or lawyer, dentist, doctor, plumber, barber, etc. All these and many more are legally conferred by State boards only, in one or many States. But they have no great weight with public opinion. He is entirely justified in his strictures on the mining engineer graduated from journalism. This is the most dangerous quack of all; the others can usually be detected by their omissions and inaccurate use of words.

In No. 2,407 'Engineer' gives a fair definition of a mining engineer, but he—like others in previous discussions—appears to give too little prominence to definiteness of opinion in a report, and to the character of the man as evidenced either internally in the report or otherwise known. A mining engineer must not only know what he enumerates, but he must be—and show himself to be—entirely unbiased. The facts seen and vouched for must be clearly distinguished from any opinion, and the final opinion must be as definite and exact as the circumstances will allow; the answer will nearly always be possible in dollars and cents.

To attempt to define the status of a mining engineer in this State will only be to put us to the level of plumbers, barbers, and veterinarians; to do so by voluntary associations like the American Institute of Mining Engineers would be ineffective and extra-legal. Those of us twenty years out of the college that had a legal right to confer the title, know what a very small percentage of our present attainment is that rudimentary part which was acquired there; we ought readily to acknowledge the right of the man who did not have that short cut but has nevertheless reached the same end by harder and more laborious path and has earned the use of the title of 'mining engineer.'

J. C. HEWETT.

Colorado Springs, September 13.

Who Is a Mining Engineer?

The Editor:

Sir—This discussion, like many others, hinges very largely on a verbal definition. Words are like tools. We may take a word and put it to many uses for which it was not originally designed, just as we may use a tool for many purposes for which it was not originally designed. We may use a pitchfork to handle gravel and a shovel to handle hay, but it is always much better to use both words and tools for the purposes for which they were designed and the only excuse there is—that is at all a valid excuse—for using a word or a tool for other purposes than that for which it was designed is that there is no other word or tool at hand which will better serve the purpose.

Now I believe the recognized authority now-a-days on the meaning of words, which is another way of saying the use for which they were designed, is the Century dictionary. The latter work defines an engineer as "one skilled in the principles and practice of any department of engineering." Mining engineering is defined as "that branch which relates to all the operations involved in selecting, testing, opening, and working mines." Now let us notice these definitions carefully; an engineer is one skilled in the 'principles and practice.' Not principles alone, nor practice alone. That throws out at once the man who has had lots of practical experience and no technical training and the man who has had lots of technical training and no experience. The newly graduated college student is not a mining engineer, neither is the old mining man who has made money out of mines, but never studied the 'principles.'

Let us now consider the definition of mining engineering. "That branch which relates to *all* the operations involved in selecting, testing, opening, and working mines." Here again we have the same idea reiterated. "*All* the operations"—not part of them. Not the part which pertains to technical training alone, nor the part that pertains to practice alone, but "*all* the operations." Not the part that pertains to milling alone, or smelting alone, or surveying alone, or mining alone, but "all the operations involved in *selecting*, *testing*, *opening*, and *working* mines." Truly the mining engineer must be an all-round man. The man who has specialized on any branch of our many-sided profession is not entitled to the title of mining engineer. He may be a chemical engineer, or a surveying engineer, or a milling engineer, or an excavating engineer, or a smelting engineer, but he is not a mining engineer.

I have heard it argued that the man who prostitutes his profession by taking part in wild-cat schemes was not entitled to be called a mining engineer. If my premises are accepted, the only excuse there is for using a word for some other purpose than that for which it was intended is that there is no better word at hand. It is true that the term 'mining engineer' might be broadened to carry a moral significance, but what is the need of it? We can speak of honest mining engineers and dishonest mining engineers. So long as a man is "skilled in the *principles* and *practice* of *all* the operations" of mining, he is to my mind a mining engineer; otherwise he is not a mining engineer.

GEO. J. BANCROFT.

Denver, September 18.

Copper in Cyanide Solutions.

The Editor:

Sir—As to copper in cyanide solutions, finding facts here at variance with those published in your issue of September 1, I thought an account of our practice here would be of interest, as well as our manner of making pure bullion from a zinc-box product high in copper.

The gold-bearing ore consists of hematite and clay in about equal proportions and 0.75% copper. On account of the clay, roasting is required to effect dehydration. Without such dehydration the treatment of slime, which amounts to over 50%, would be impossible, either by filter-pressing or decantation. The latter is the method we employ, using shallow vats 19 in. high, which settle completely in four hours, including the decantation of the clear solution. The loss in cyanide is about four pounds per ton, with a solution containing 1½ lb. cyanide.

The zinc-boxes, of eight compartments each, show pure copper in the last two compartments, and gradually turn black toward the head. The copper is not loose and spongy, but adheres firmly, and to all appearances looks like pure copper shaving. I am inclined to believe that, in this instance at least, copper helps in the precipitation of gold and silver because a copper hue on the zinc has always been a proof that the sump assays only a trace in gold. These coppered shavings when treated with sulphuric acid, and then cupelled, yield gold 1,000 fine; so that the sump must be free from silver.

We have found it necessary on but two occasions during the past two years to dress the zinc in the boxes and then the last compartments were not coated with appre-

ciable amounts of copper. We simply clean up the first and part of the second compartments every month, unless previously gold slime has so accumulated that it retards the proper flow of solution.

The short zinc is not removed. We find in this fact a contradiction to many authors who claim short zinc to be inert. The fact that we can return short zinc with no accumulation of such product, is a proof of its precipitating qualities. Only what can be washed through a 20-mesh screen is treated with acid and—this before acid treatment—is separated by stirring in water and decanting the suspended slime until only a coarse granular mass is left. The latter is treated with sulphuric and the former with hydrochloric acid. The slime contains a large percentage of calcium carbonate, which forbids the use of sulphuric acid on account of the regulus that would be formed in melting and on account of adulteration of precipitate with sulphate of lime.

Ten parts of the coarse or 12 parts of the slime after acid treatment are melted in a graphite crucible with about eight parts of a mixture of 26 litharge, 20 borax glass, and one nitre. The melting must be quickly performed to prevent formation of too much lead from the action of the graphite in the crucible, and unless considerable experience is obtained as to the proper time and heat, a flux consisting of equal parts of bicarbonate of soda and borax glass would be safer. The use of litharge, on account of its rapid shrinking before complete melting, allows of several fillings before fusion. The flux and charge are mixed after wetting sufficient to prevent dusting.

The smaller bars resulting from different melts are now ready for refining as follows: Place inside of No. 35 graphite crucible, a Battersea P crucible so that the bottoms of each touch. To accomplish this, the graphite crucible must be slightly clipped inside for about an inch from the top. Melt the bars in the clay crucible and then add, from time to time, a little nitre until the metal is covered with slag, which should then be skimmed by means of a small crucible (10 grams) held with tongs. Repeat the adding of nitre and skimming until the skimmings show but little lead and the bullion looks bright. On an average, the bars which before refining are 700 to 800 fine, yield by above treatment bars of over 900 fine.

In case the soda flux is used, about five per cent metallic lead should be melted with the bar, as without lead the copper is difficult to remove. The refining takes about an hour after melting. If all the melts are made, using a clay crucible direct, bullion of 985 fine can be produced in the original melt, using either litharge or soda flux. However, as I was not able to obtain larger clay crucibles than the Battersea P size and as the heat must travel through two crucibles, clay breaking in direct contact with coke, I found it preferable to refine in one melt.

C. A. ARENTS.

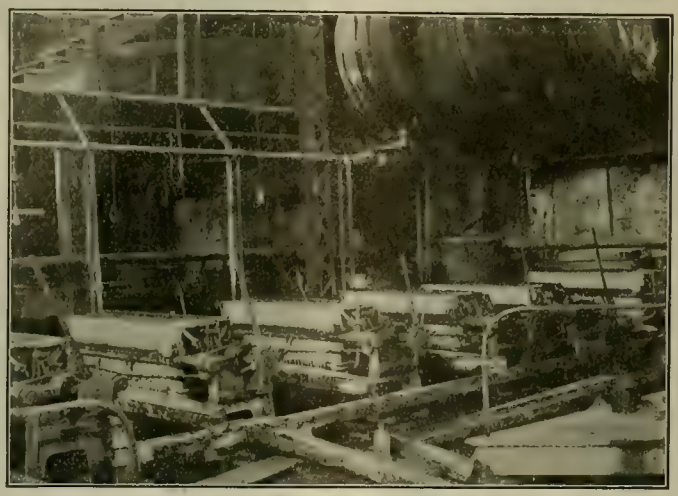
Copperopolis, Cal., Sept. 17.

Zinc-Dust Precipitation.

The Editor:

Sir—After reading your remarks concerning zinc-dust precipitation I have been enquiring among my professional friends and from one of them I have secured information which I feel sure will interest others as much as it did me. This engineer was superintendent of a 100-ton sand and slime-plant. Slime was treated by decantation and sand by percolation, the ore containing both silver and gold, with over 50% of the value in gold.

The precipitation plant consisted of three 15-ton flat-bottomed wooden tanks, a six-inch self-acting compressor, a four-inch triplex belt-driven plunger-pump, and two 2.5-ton filter-presses. One of the latter was a Johnston press with six-inch frames. The leach from sand and slime ran to a sump whence it was pumped to one of the three agitation vats. This pregnant solution was worth about $2 per ton. The compressor was started and air pumped through a ¾ in. line to a grating of half-inch pipes in the bottom of the vat. These branch pipes were perforated. Two to four pounds of zinc dust were added (an average of 3.5 lb.) and the agitation with air continued about twenty minutes. The charge was then pumped by means of the triplex plunger through the press. One press held about one month's product. In order that the press should fill completely, it was the custom to close the discharge-cocks of the frames in the half nearest the inlet, gradually opening them as the farther frames became filled.



Zinc-Dust Precipitation at the Mercur Mill, Utah. Agitation Tank in the Background and Filter-Presses in Front. Compressed-Air Receiver to the Right.

The plant treating the ore produced a product worth $20 per lb., while the plant treating old tailing from a former pan-amalgamation mill made a precipitate worth $8 per pound.

This precipitate was treated with sulphuric acid, roasted in an iron muffle and melted in pots. The zinc dust costs 5.5 to 6 cents per pound at the works. No attempt was made to remove the zinc oxide with ammonia. The quantity of zinc used was governed by the value of the barren solution. Sometimes an increase of zinc made a better precipitation and at other times an increase in the strength of solution used on the ores attained the same result. A twenty-cent tail-solution was considered very high. The precipitation vats were flat-bottomed, and this necessitated an occasional clean-up, which consisted of hard labor with hammer and chisel. This difficulty could be avoided by having conical-bottomed vats. About 225 tons were precipitated in 24 hours.

The presses would stand a pressure of 40 lb., although it was the custom to fill the presses with as low a pressure as possible, pumping the solution at a rate barely sufficient to keep up with the plant.

No naked flame should be allowed around the press while opening, and the cigarette smokers must be kept at a distance. A flame applied to the charge when the press is first opened will explode the hydrogen mixture, separating the frames and scattering mud.

Some years ago I was shown the plant at Mercur and

no secret was made of the method of precipitation, and the same statement applies to the attitude of those in charge at Lead, South Dakota.

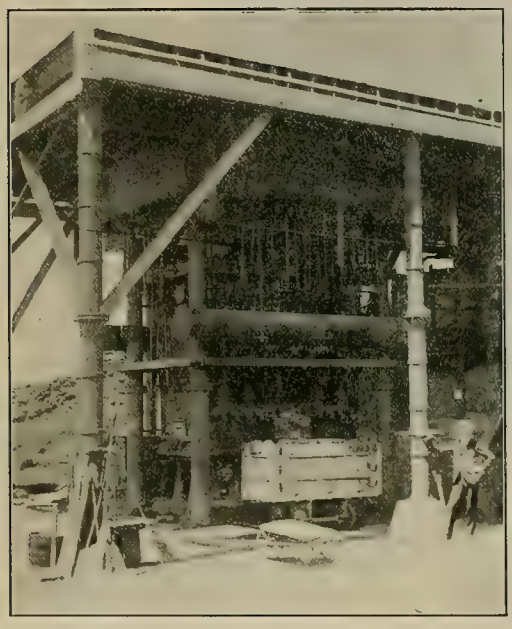
MARK R. LAMB.

Goldfield, Nevada, September 4.

In the Desert of Central Australia.

The accompanying illustrations represent the underground workings and the smelter of the Blinman copper mine in South Australia. It is situated 272 miles north of Adelaide and 14 miles east of the transcontinental railroad.

This mine was worked in the sixties and produced 250,000 lb. previous to 1874, when it closed down. It worked at irregular intervals subsequently, until 1903, when it was purchased by the Tasmanian Copper Co., an English corporation which was formed to work the Rosebery mine in Tasmania, which itself has proved too low-grade for profitable working up to this time. The present proprietors have spent a considerable sum of money



Copper Smelting Furnace. Old Pipes From Mine-pumps Used to Support Feed-floor.

in re-opening the mine, and have erected a modern copper furnace, which smelts 150 tons of ore daily. In 1904, 9,055 lb. was produced; in 1905, up to the end of June, 26,900 lb. It has worked continuously and profitably ever since. At present operations are carried on at the sulphide level, the ore sent to the furnace requiring no roasting and averaging about six per cent copper. The deepest shaft is about 450 ft. below the outcrop. The ore occurs as masses and veins in magnesian limestone, and there is a large body of low-grade material. Only the richer portions are smelted; the great bulk of the ore-bearing formation will require concentration.

In the first photograph, the open-cut on the 90-ft. level is shown. The man is about to dump the content of a car into a mill-hole. In the other is shown the copper smelter, open to the air and in the full glare of the sun. It will be noticed that the supports for the feed-floor are pipes taken from an old mine-pump. The furnace smelts 150 tons of ore per day, making 10 tons of matte, averaging 55% copper.

THE reasoning of many is but little more than a decent pretext for the adoption of foregone conclusions.

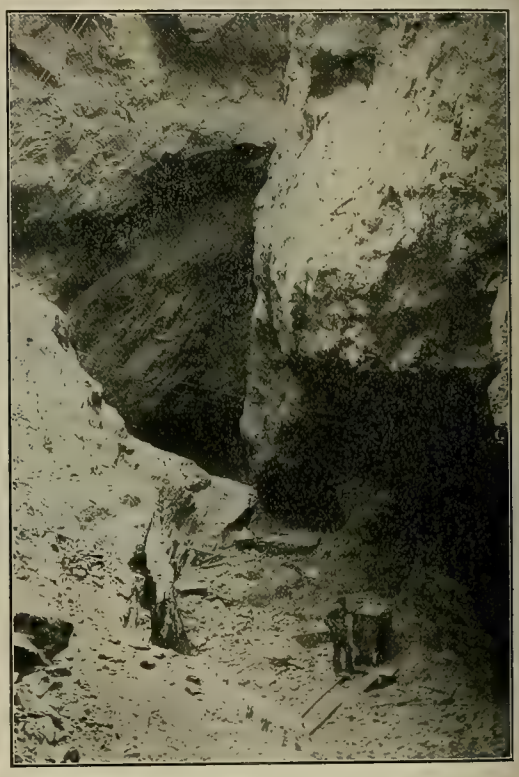
The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Wadsworth, Nev., marked C. W. is Quartz-mica-diorite, in which the quartz is predominant.

The minerals from Juarez, Chihuahua, Mex., are: No. 1, Heavy Spar (baryta); No. 2, Syenite, with flakes of molybdenite on one side; No. 3 is principally Pyrolusite (manganese oxide) and gypsum.

The rocks from Challis, Idaho, marked O. F. R. are: No. 1, metamorphosed clay rock; No. 2, chert, produced



Open-cut of Blinman Mine, South Australia.

by silicification of some rock, perhaps limestone. It is brecciated and includes fragments of the black rock.

The rocks from Salt Lake, Utah, marked L. L. M. & M. Co., are: No. 1, Contact-breccia, in which the quartzose portion contains much pyrite, though pyrite is disseminated throughout the rock; No. 2 is practically all Silica, and is evidently the result of silicification of some rock, possibly rhyolite. It has the appearance of some Nevada gold ores, and both of these rocks should be assayed for gold and silver.

The rocks from Mammoth, Ariz., marked R. E. D., are: No. 1, Quartz-mica-diorite. In this rock copper carbonate is seen in small amount, usually associated with the biotite, which it has apparently replaced to a slight extent. No. 2, is Aplite, but has suffered some alteration; No. 3 is similar to No. 2, but has become infiltrated with copper carbonate. It should be assayed for gold and silver as well; No. 4 is Mica-diorite; No. 5 is also diorite, but has been crushed and the individual mineral constituents much altered. A little copper carbonate is observed in this rock also.

Ore Treatment at the Combination Mine, Goldfield, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By FRANCIS L. BOSQUI.

I. METALLURGY.

The Combination mine, situated about one-half mile northeast of the town of Goldfield, consists of ten full claims and three fractions, aggregating 200 acres. The original discovery on Combination ground was the first of any importance made in the now famous camp. The property was acquired from prospectors in 1903 by the representatives of two Eastern exploration companies, who, after a visit to one of the outlying districts, happened to be passing through the present site of Goldfield on the way to Tonopah; and thus, at the very outset of its career as a gold producer, the Combination was



Hauling Ore to the Railway.

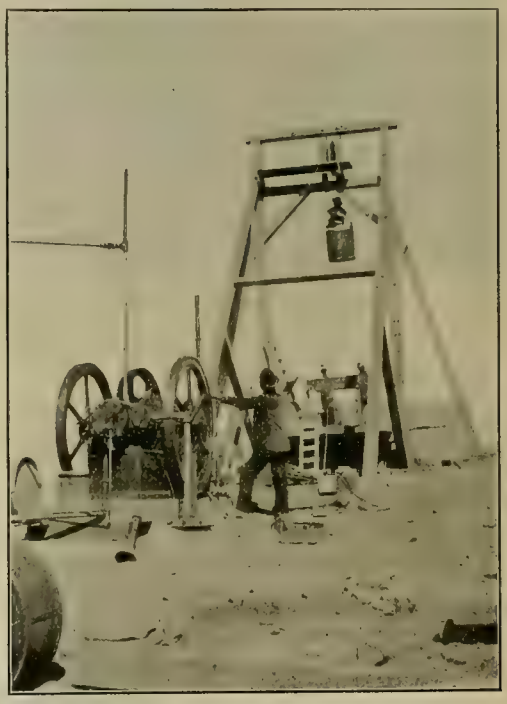
blessed by the happiest accident that can befall a mine—it passed into good hands. The property has since occupied a unique place among the mines of southern Nevada. It has been well administered; it has had the benefit of the most approved and practical methods in mining and metallurgy; and its development has not been hampered by stock manipulations. Consequently, though the most interesting property in the district, whether we consider its varied metallurgical problems, or its ratio of output to small mill-capacity and small development, it is the least advertised and the least discussed.

The first shipments from the Combination were made in December, 1903. The gross output of the mine from the commencement of operations to April 1, 1906, is as follows:

		Value	Total Value.
Shipping ore (tons)	1,773	$438.24	$776,992.84
Stamp bullion (oz.)	13,584	19.48	264,506.30
Concentrate (tons)	230	352.05	80,972.07
Cyanide precipitate (lb.)	734	45.77	33,594.18
Cyanide bullion (oz.)	4,401	16.44	72,346.51
			$1,228,411.90

The property was a shipper from the grass-roots. Almost any grade of ore could be segregated by rough screening and sorting, the practice being to reserve the milling ore ($25 to $100) in graded dumps until the completion of a mill. In shipping it was at first necessary to haul the ore to the railroad, a distance of 60 miles. The costs of transportation and smelter treatment were so high as to emphasize the importance of treatment on the ground, and an investigation was at once commenced with a view to installing a reduction plant.

The ore has been described as a highly silicified dacite occurring in zones of fissuring in the decomposed dacite constituting the country rock. In the more shattered portions of the orebody the dacite is almost entirely altered into quartz, with stringers and patches of kaolinized material. During the progress of the preliminary tests, the ore showed certain freakish variations which made it difficult to decide upon a method of treatment. The fineness of the gold, and the almost entire absence of concentratable material in the upper levels indicated dry-



Original Combination Shaft. Man in Bucket.
(Site Now Occupied by Large Open-Cut.)

crushing, and a testing plant for dry-crushing was installed. But even after a long leaching with cyanide solution, it was still found possible to pan an appreciable quantity of gold from the residue. These tests had scarcely begun before the gold in the mine became coarser, and the proportion of sulphides increased. A series of tests by amalgamation, concentration, and cyanidation, gave decidedly promising results, showing an average saving of 45% by the first, 5% by the second, and about 40% by cyaniding the residual sand and slime—a total of about 90%. Later, it developed that certain portions of the oxidized ore carried a disquieting amount of acid—free sulphuric and ferrous sulphate, with here and there enough alum to make the rock astringent to the taste. In some of the tests the ore was so acid as to require 50 lb. of lime per ton as a neutralizer. But this very acid ore was not found to be in sufficient quantity to affect the general treatment seriously; and in subsequent milling tests an average sample of all the accessible oxidized ore was taken, and the acid condition met by using from 10 to 12 lb. lime per ton.

The results obtained in ore-tests made at Goldfield in

the early months of 1904 were confirmed during the summer by mill-runs made at an ore-testing plant in San Francisco. The representative test, which gave the best results, was made as follows:

1. Crushing through 40-mesh wire screen.
2. Plate amalgamation.
3. Concentration on a Frue vanner.



The Beginning of the Combination Mine.

4. Hydraulic separation of slime in cone-classifiers.
5. Leaching sand with cyanide solution.
6. Agitating slime with cyanide solution.

The best conditions for the sand were found to be eight days' leaching with a 0.2% solution; while the slime required four hours with a 0.15% solution. The following is a record of extraction from slime:

	Gold. oz.
Assay heads	1.20
Assay after 1 hr. agitation	0.46
" " 2 " "	0.20
" " 3 " "	0.14
" " 4 " "	0.12
" " 5 " "	0.12
" " 6 " "	0.13
" " 7 " "	0.12
" " 8 " "	0.12

The amalgamation plate and zinc-box were cleaned up and the following results obtained from the whole test:

Indicated extraction by cyanide, 83.4%.

Actual extraction by cyanide, 77.9%.

Indicated total extraction by all processes, 93%.

Actual total extraction by all processes, 91%.

On a small scale, better results were obtained by crushing to 50 mesh, and it was found that by sliming the whole product, a still higher recovery might be made. But the unproved efficiency of American tube-mills at the time the tests were made and the high cost of power and labor at Goldfield, left the advantage in favor of sliming too small to justify the experiment.

The mill was originally designed to treat oxidized ore only, although in places in the oxidized zone there were found small quantities of sulphide ore which resisted mill treatment by ordinary methods. But as there was no indication of the development of a large amount of sulphide ore at the time construction commenced on the mill, the installation was allowed to proceed. It was while the mill was being built that large shoots of sulphide ore were opened up as the limit of the oxidized zone was reached, and before the end of the year an extensive dump had accumulated with an average content of about 3 oz. gold. This was reserved for special treatment, and samples taken for investigation.

The sulphide in the 'sulphide ore' of the lower levels is a simple iron pyrite, for the most part finely disseminated. The following is an analysis of the ore:

Silica, 70.4%; alumina, 17.0%; sulphur, 4.2%; iron, 8.5%; and copper, trace.

Direct cyanide treatment was tried in all practicable variations, but without good results.

After grinding through 200 mesh and agitating 15 hr. in a 0.25% cyanide solution, the recovery was only 60%, with a 4-lb. cyanide consumption.

Roasting and leaching a 20-mesh product gave an extraction of 91%, with a 7.2-lb. cyanide consumption.

Roasting a 20-mesh product, regrinding to 200-mesh, and cyaniding by agitation in a 0.25% solution gave 93% extraction.

Pan amalgamation of the roasted ore gave an extraction of 54 per cent.

Oil concentration (Elmore process) of raw ore, with agitation of tailing in cyanide solution, gave 90% extraction with a consumption of 7½ lb. cyanide per ton.



Goldfield, at Sunset, in 1904.

Oil concentration followed by cyanogen bromide treatment of the tailing gave an extraction of 96% from heads assaying 3.48 oz. gold.

Chlorination by leaching, using an aqueous solution of chlorine produced by bringing together an 0.8% sulphuric acid solution, and a 0.7% chloride of lime solution, and leaching 36 hr., gave a recovery of 40%.

Chlorination by the barrel process, after four hours' treatment, yielded 78 per cent.

These various methods were tried before wet concentration, because the aim was to treat all products on the ground and avoid shipping. A combination of concentrating and cyaniding, however, was ultimately considered the most suitable to Goldfield conditions, and was adopted.

The ordinary concentration of 30 or 40-mesh product was found ineffective. It did not make a close saving of the fine sulphide, which had to be removed on account of the poor cyanide recovery from the raw sulphide. It was necessary to evolve some closer method of recovery which would leave nothing for cyanide treatment except the finest particles that might elude the most efficient concentrating machinery. The only way to accomplish this was by a series of reductions, and by following each stage by appropriate concentration. The sulphide freed at each stage of grinding was at once removed before the ore passed to the next and finer stage of grinding, and thus an unnecessary comminution was avoided.

The following mill test forms the basis of the method adopted in practice. The ore, assaying 3.01 oz. gold, was crushed in stamps to 30 mesh and passed over a small Wilfley concentrator. This yielded 6% (by weight) of concentrate, assaying 27.4 oz. gold. The tailing was re-ground through 60 mesh, and re-concentrated; yielding 2.11% concentrate, assaying 19.8 oz. gold. The 60-mesh tailing was re-ground through 100 mesh and concentrated, yielding 0.4% concentrate, assaying 20.4 oz. gold. The residue was then ground to 200 mesh, and passed over a canvas table, yielding 10% of silicious concentrate, assaying 3.97 oz. gold. The final tailing from the above operation assayed 0.52 oz. gold, showing an extraction by concentration of 80%. The extraction by canvas alone was 13%, showing the marked adaptability of canvas to ore of this character containing so much extremely fine sulphide. Cyanide treatment of the slime resulting from this series of successive reductions and concentrations reduced the tailing to 0.22 oz. gold, making the total extraction 93 per cent.

This method was adopted because the required plant could be conveniently added to the mill already installed, and the same system of crushing used. Though a little complicated, the process was the least so of any of the methods considered. The high cost of fuel and supplies in Goldfield barred roasting. Besides, so long as the ore concentrated well, the advantage gained by segregating the roastable portion of the ore in small bulk was obvious.

The concentrate from the sulphide ore is now being shipped. It may later be treated by chlorination on the ground. The concentrate from the oxidized ore is about to be treated in the mill by fine grinding and prolonged cyanidation.

THE SEARCH FOR DIAMONDS.—Never before in the history of the United States has there been such a demand for diamonds as there was in 1905. Large quantities were imported, but the country produced none. In 1903 it produced diamonds to the value of $50, in 1901 it had an output worth $100, in 1900 its production was valued at $150 and in 1899 the country boasted native diamonds to the value of $300. Diamonds have been discovered in the United States in four different regions, but their actual place of origin is in every case unknown. All have been found in loose and superficial deposits, and all accidentally. It is not at all improbable, however, that some day the original sources of this queen of gems may be discovered.

GEOLOGY is every day assuming a greater importance in mining, but among its fundamental conceptions there must be no confusion between what is certain and what is more or less probable.

Coal Production.

According to the report of Edward W. Parker, Statistician of the United States Geological Survey, which is now in press, the production of coal in 1905 amounted to 392,919,341 short tons, having a value at the mines of $476,756,963, surpassing in both quantity and value all previous records in the history of the country. Compared with 1904, when the production amounted to 351,816,398 short tons, valued at $444,371,021, the output in 1905 exhibits an increase of 41,102,943 short tons, or 11.7% in quantity, and of $32,385,942, or 7.3% in value. Prior to 1905 the maximum output of coal was obtained in 1903, when the production amounted to 357,356,416 short tons, valued at $503,724,381, compared with which the record for 1905 shows an increase in production of 35,562,925 short tons, and of $26,967,418. The high value recorded in the statistics for 1903 was due to the somewhat abnormal inflation of prices, caused by the shortage of fuel supplies, which resulted from the strike in the anthracite region of Pennsylvania in the preceding year. The lower values in 1904 as compared with 1903 were simply a return to normal conditions, but the decline in 1905 was the result of a production in excess of market requirements, unusually large as they were.

Of the total production in 1905, 69,339,152 long tons (equivalent to 77,659,850 short tons), were Pennsylvania anthracite, with a value at the mines of $141,879,000. The total production of bituminous coal and lignite was 315,259,491 short tons, valued at $334,377,963. The production of anthracite coal in Pennsylvania in 1905 was 4,020,662 long tons (or 4,503,151 short tons) more than that of 1904, while the increase in the production of bituminous coal and lignite was 36,599,882 short tons. A portion of these increases in both anthracite and bituminous production was due to the efforts of operating companies to provide a supply of fuel in anticipation of a suspension of mining in April, 1906, when the wage scale agreements in the organized coal producing States and the award of the Strike Commission in the anthracite region of Pennsylvania would terminate.

Of the total amount of bituminous coal produced in 1905, 103,396,452 short tons were mined by the use of mining machines, as compared with a machine-mined product in 1904 of 78,606,997 short tons. The number of mining machines in use increased from 7,663 in 1904 to 9,184 in 1905.

The total number of men and boys employed last year in the coal mines of the United States was 626,174, against 593,693 in 1904. Of the total number employed in 1905, 165,406 were in the anthracite mines of Pennsylvania, and 460,768 were employed in the bituminous coal mines.

The larger part of the increased production in 1905 was due to the great activity in the iron industry, as is shown by the fact that the amount of coal made into coke increased from 31,278,537 short tons to 42,412,328 short tons, and that the larger increases were in the coking coal producing States and those which furnished fuel to the iron furnaces.

A BOULDER 17 by 12 by 7 ft., weighing 60 tons, has been dislodged from the bed of the Nile by the powerful current issuing from the barrier at the Assouan dam and hurled against the masonry. The tremendous force of rapidly moving water is not generally recognized. It is estimated that the weight of solids which can be moved by a stream increases as the sixth power of the velocity; thus, a stream moving at 10 miles per hour can move 64 times the mass which can be moved by a stream at 5 miles per hour.

Three Weeks in Mexico---VI.

Cyanide Practice at El Oro.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

A few scattered notes on El Oro mill may be worth recording. The bolts of the battery-frames are coupled by washers; these are 6 to 10 in. long and from 2½ to 3 in. wide; they connect two bolts and hold them firm. If one gets loose, the other holds it in grip and prevents movement.

The guides are made at the company's foundry, of cast iron; instead of being sectional with bolts, they are one solid piece. Each stamp has its own guide and a right-angle plate, to keep it in proper place and line. The wear is slight and therefore the stamp works smoothly; there is less heating than with wooden guides.



Elevator-Wheel and Cyanide Vats. El Oro Mill.

The mortar is a development of the anvil-block. This is an excellent mode of construction, if properly done. I know of one case—not in Mexico—where trouble was caused by the anvil-block being constructed so that it did not rest perfectly true on the cement foundation; to remedy this it was the custom to shim the concrete block with a little cement; when this last broke and crumbled, there was a movement of the mortar itself. At El Oro, the mortar-block is made extra heavy, combining to some extent the anvil in itself, with a base three feet wide and a bottom 13 in. thick; this is placed upon a concrete foundation, with a piece of quarter-inch rubber belt between.

At El Oro, cones are superior to spitzkasten; the sizing tests have proved this abundantly, the separation by the cones being much sharper. The circulation and agitation of slime are aided by six pumps which are the Butters modification of the Gwynne pump, such as is used in the London dock-yards. They are of the centrifugal type; compressed air is introduced to effect aeration of the solution. The chief advantage of the Butters modification is that all wearing parts are readily removable. Each pump makes 1,300 rev. per min. and in that period handles 4½ tons (3½ tons being solution) of slime.

The vats are all made of steel plates, 3/16 in. thick on sides, with ¼-in. bottoms. Redwood laid down at El Oro comes to the some cost, but the steel is more durable and makes a tighter vat in the climate of central Mexico. The vat does not dry if empty, there are no staves to check, and no absorption of solution.

In the precipitation house, there is used a device introduced independently by W. K. Betty in South Africa and by Alfred F. Main at El Oro; I refer to a drop-drip of KCy (2½% solution) over the head compartment of each zinc-box that is precipitating from the weakest solution, namely, that coming from the treatment of slime. This drip makes the zinc more active, so that a precipitation of precious metal is obtained in a manner usually unattainable from so weak a solution, that is, one containing only 0.02% KCy. Still weaker solutions are successfully precipitated in which the quantity of KCy is so small as not to be detected by the ordinary silver nitrate test.

The method of dipping the zinc shaving in lead acetate (to aid precipitation) is not employed at El Oro because lead acetate is used at another stage of the process, as already explained. Zinc fume was tried, but it was ineffective with such weak solutions. Great care is taken with the zinc shaving, to cut it in thin but tough filaments, not so crinkly as to break easily in handling. The shaving is laid in the boxes most carefully, so as to avoid channeling. El Oro plant is the only one of its size where acid treatment is not used. From the boxes the zinc is sent through launders, to be carefully screened, while it is also being washed with fresh water. Then it is pumped into two filter-presses until they are full, the charge being equivalent to 19,000 oz. of bullion. The effluent solution is returned to the sump, the cakes in the press are washed and then dried by steam, the steam heating the iron of the frame sufficiently to dry the cake inside. The cakes are dried to such a consistence as will facilitate fluxing before briquetting; they fall into a car and are then mixed with the fluxes needed for melting; the mixture is fed into a briquetting machine, making round bricks 3½ in. thick with 3 in. diam. These are dried before being thrown into the melting pot, from which bars of 1,000 oz. are cast. The Mexican workmen are compelled to remove their clothes after work, before passing to the outer room. The precipitation room has a cement floor and the furnace has a dust-chamber.

The development of milling at El Oro emphasizes the relative importance of the cyanide annex in the modern wet treatment of precious-metal ore; the annex to the new mill required an expenditure a little over twice the cost of the new 100-stamp mill itself. The tendency is to increase the percentage that is re-ground, the perfection of the extraction being closely determined by the fineness of comminution. At the time of my visit the aim was to make two products; sand, as near 150-mesh as possible (and a decreasing percentage even of that) and slime, that is, all below 200-mesh. Of course, the sand, even when re-ground, is different from the clay despite equality in

size of particles; the grains of 'sand' are sharp as against those of a mud (slime) rendered impalpable by absence of sharp edges. 'Sand,' however fine, filters well, while 'slime' will not filter at all; it packs like glue. On the other hand, by reason of the relatively larger surface presented by minute particles, chemical action on the precious metals is almost instantaneous. How necessary re-grinding is, was shown by a simple experiment made by Mr. S. H. Pearce. Sand, after ordinary cyanide treatment at the old mill, where there is no re-grinding, was dissolved in *aqua regia*, but the 'purple of Cassius' test, with stannous chloride, gave no precipitate whatever, the gold being effectively locked within the grains of

Which of these two sands is the finest? Caetani answers the question from the economic point of view, thus: It is desired to know the fineness of a sand for the reason that the finer the sand, the better the extraction obtained. Therefore the maximum possible extraction on a sand of given composition *is a number proportional to its fineness, considered from an economic standpoint*. As at El Oro one can *a priori* calculate exactly the extraction from a sand when a sizing test has been made, therefore one can calculate the index and represent thereby with *one* number what would otherwise have to be indicated by a tabulation consisting of 14 numbers. In the examples quoted at the beginning of the

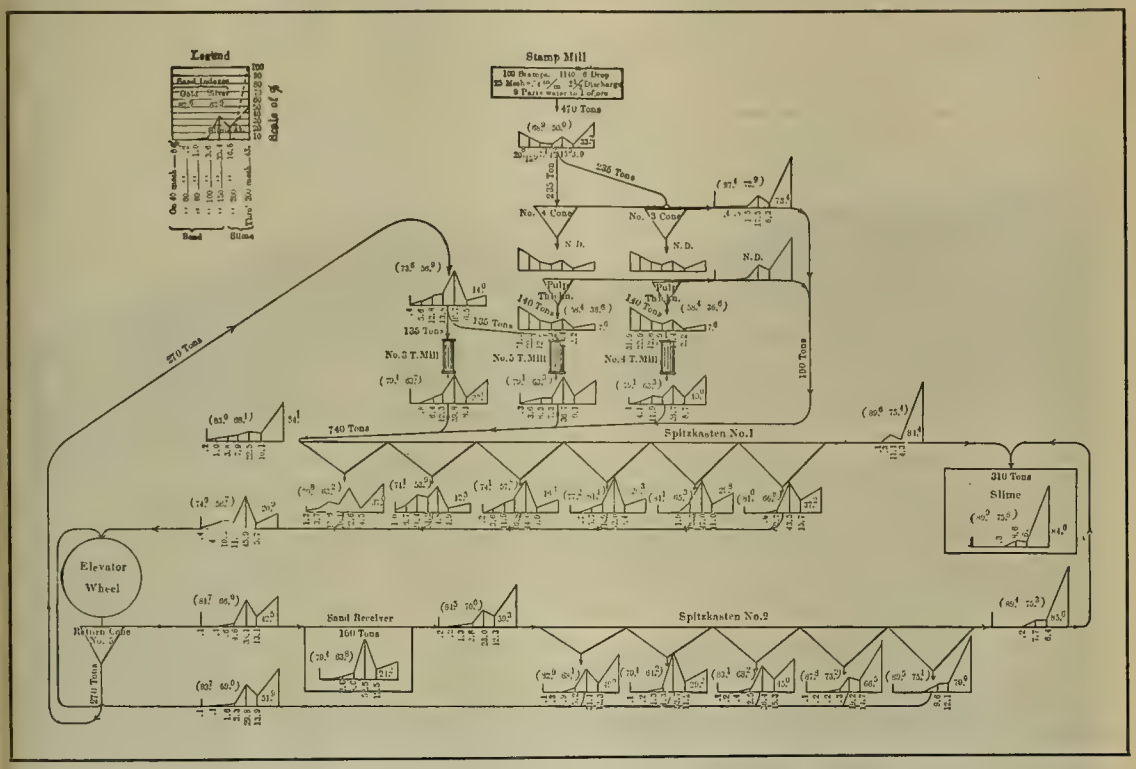


Fig. 2.—Diagram of Sizing-Tests at Mill No. 2. (September 1, 1905.)

sand. The assay of the sand gave $4.50 per ton. Hence the need for re-grinding.

The accompanying record of tests will prove interesting to those engaged in cyanide work. Looking at Fig. 2, it will be noted that the legend explains the graphic representation of two sizing tests. At the time of these tests, a 2½-in. chuck-block was used, but it was too low to have much effect on the degree of fineness of the product; during the test the stamp-discharge was as through 28 mesh. Under these conditions the load on the tube-mills and on the plant became too heavy, so that finer screens were substituted shortly afterward. In the diagram (taken from the paper by Caetani and Burt, already mentioned) the ordinates represent the size of the screen and the abscissæ the percentage retained on each of the screens. In the legend "Thro' 250 mesh" should read "through 200 mesh."

The use of the term sand-index, to be seen in the note appearing on the diagram, requires explanation. Caetani and Burt employ it, and it represents one of the most valuable features of their paper. The problem was the following. Given two sands of the following analysis:

Mesh	On 20 %	On 40 %	On 100 %	On 200 %	Through 200 or slime %
1st sand	10	30	25	5	30
2nd sand	5	15	45	15	20

paragraph, the second sand is finer than the first, although it contains less slime.

REPORT OF CYANIDE DEPARTMENT, SEPTEMBER, 1905.

MILL NO. 1.

Classification—	%	Tons treated.	Gold: Assay value per ton. $	Gold: Indicated extraction. %	Silver: Assay value per ton. $	Silver: Indicated extraction. %
Coarse Sand	29.23	2,552	9.46	54.33	1.73	27.17
Fine Sand	25.57	2,233	7.86	72.14	1.57	45.86
Slime	45.20	3,947	9.04	93.58	2.03	82.26
Total	100	8,732	8.86	76.50	1.83	58.99

REMARKS.—Old mill built before re-grinding was adopted. Fine sand poorer than coarse because it contains less gold open to attack. Slime richer in silver by presence of sulphide.

MILL NO. 2.

Sand	24.12	2,527	8.28	83.94	1.59	65.41
Slime	75.88	7,949	7.68	92.45	1.64	78.05
Total	100	10,476	7.82	90.28	1.63	75.08

REMARKS.—New mill includes systematic scheme of re-grinding, as shown by increased proportion of slime. Better extraction on slime raises general result to a satisfactory figure.

The Esperanza mill had 120 stamps when the present company took it over, in 1904. It was deemed advisable to increase the capacity at the least possible cost, so 15 Huntington mills (each of 5-ft. diam.), were added, with the idea of re-grinding before cyanidation. This was

tried, but it was found necessary to place the Huntingtons above the stamp-batteries, which necessitated elevating the pulp. It being therefore difficult to distribute the pulp to the Huntington mills, it was finally decided to use the latter machines for first grinding, in association with, instead of in succession to, the stamps.

The crude ore passes over a 1½-in. grizzley before it reaches the rock-breakers; after being crushed by them, the ore goes over a ¾-in. grizzley, the undersize being allotted to the Huntingtons and the oversize to the stamps. The batteries are provided with 60-mesh screens; while the pulp issuing from the Huntington mills goes through an angle-slot screen equivalent to 60 mesh, but 65% of the product will pass 200 mesh.

Of the 15 Huntingtons, six are now used as first grinders on low-grade sulphide ore, the product being sized and distributed to six Wilfley tables, the tailing from which, after classification, passes down blanket sluices before finally reaching the cyanide vats. The concentrate from the Wilfleys and that washed from the blankets, goes to the smelter at Aguascalientes.

The other nine Huntingtons treat oxidized ore, which, after being ground, goes to the cyanide annex. The cost of steel and repairs to wearing parts amount to 34 *centavos* per ton; labor averages 15 to 20*cv.* per ton. The muller shells and die-ring are made of rolled steel manufactured by the Midvale Steel Co., of Philadelphia. This is a soft metal and is susceptible of being kept to shape; it can be used until worn out, and is, therefore, economical. Each Huntington mill has its own motor; it has proved itself to be the best machine for reducing the ore to a certain point—say, 60 mesh—beyond which, for finer grinding, it is not economical.

The sand undergoes treatment for 100 hours; for it is found that extraction ceases then. Aeration is effected by a perforated pipe discharging over the return-solution vat; yet there is no such loss of KCy as might have been expected. The former collecting vats are now used for treatment; there is less aeration and less mixing, but there is a great gain in the capacity of the plant without interference with effective percolation. A vacuum-pump, for withdrawing the enriched solution, is used only at the close of the operation. Sodium cyanide, NaKCy, is the chemical employed; it is guaranteed equal to 125% active KCy, ranging from 124 to 128%. The enriched solution, before precipitation in zinc-boxes, is rarely higher than $2.20 in gold. Fresh cyanide, in crystals, is added to the head of the zinc-boxes, sometimes in quantity sufficient to keep the solution up to standard strength.

There are no amalgamating plates, and no mercury is used in the Esperanza plant. This is an interesting divergence from El Oro practice.

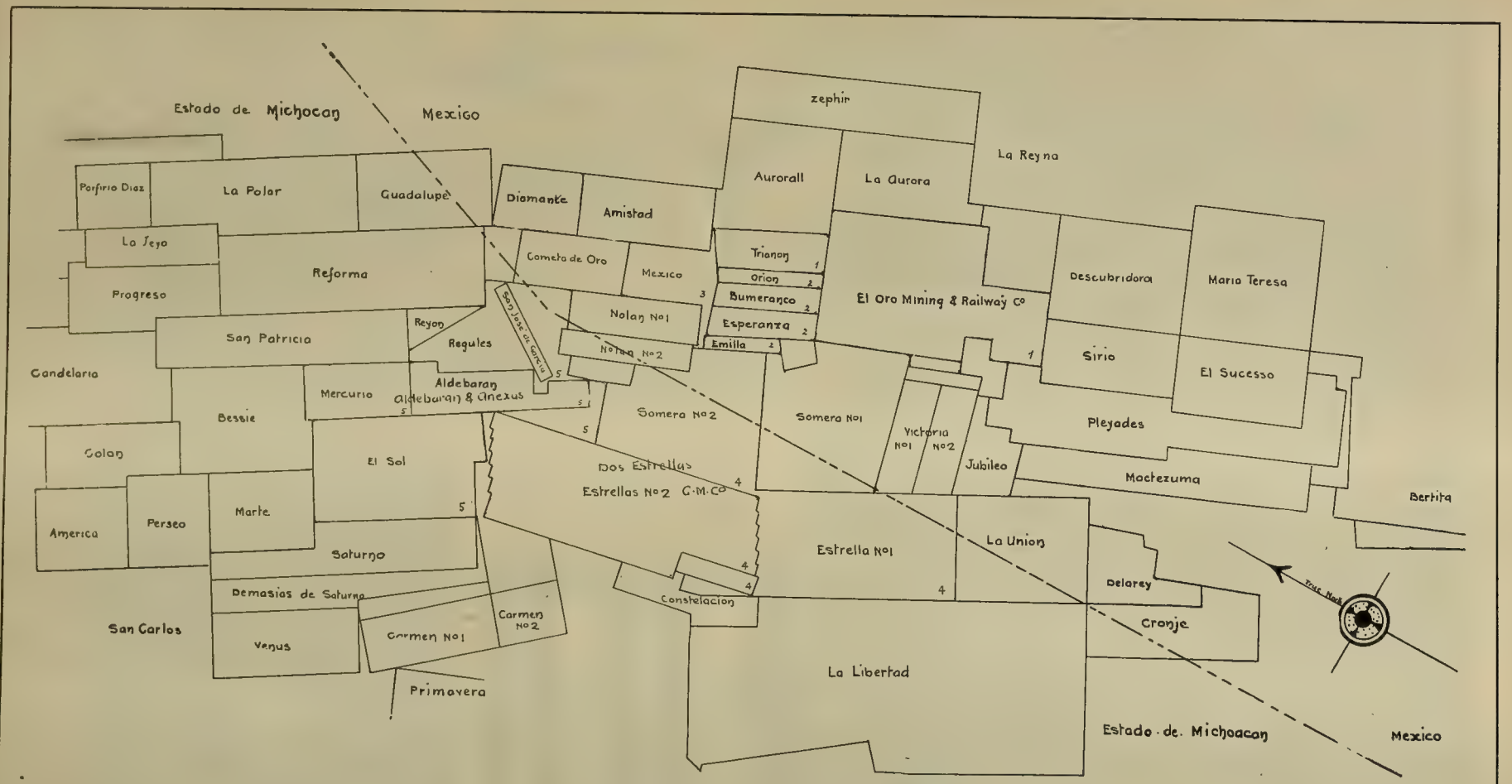
During September, 1905, the output of the mine consisted of 5,280 tons of shipping ore and 12,000 tons of milling ore, having together a value of $780,385 U. S. currency. The extraction in the mill was 91.64% of the gold and 52.92% of the silver in the crude ore.



Esperanza Mine and Mill, El Oro, Mexico.

AT least $150,000,000 of foreign capital was invested in enterprises in Mexico during her first year as a gold-standard country, about one-half of it American, the rest largely French and Canadian. Most of the new American capital was invested in railroad construction, mines, smelters, reduction works, and plants for the treatment of custom ores; timber tracts, agricultural lands, city real estate and mercantile enterprises. Our holdings in Mexican mines were increased by something like $25,000,000. Our total investment in enterprises in Mexico is now $600,000,000 in round figures. At the rate of increase at present indicated it will soon reach the $1,000,000,000 mark.

THE scientific man accepts his limitations and does not expect to arrive at absolute verity. He observes; and when he has advanced far enough to begin to generalize, he formulates his ideas as an hypothesis to serve as a basis on which to work until someone has suggested something better.



Map of Main Portion of El Oro District, Mexico.

No. 1. El Oro Mining & Railway Co., Ltd. No. 2. Esperanza Limited. No. 3. Mexico Mines of El Oro, Ltd.

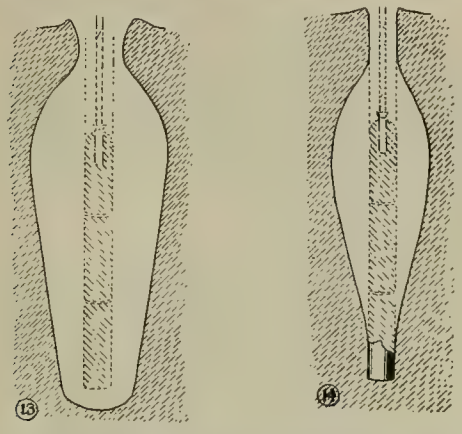
No. 4. Dos Estrellas Mining Co. No. 5. Victoria y Anexas Mining Co.

The Value of Detonating Caps in Blasting.

By ROLAND L. OLIVER.

(Continued from Page 386).

*It is the nature of the initial detonation to the powder around the cap which governs the greater or less effect of the explosion of the whole charge. The cap communicates to the first particles of powder a disruptive impulse, which, according to the nature and strength of the cap, more or less completely overthrows their equilibrium and decomposes the powder with great energy, setting up sympathetic vibrations that explode the particles of powder in turn by the violent disturbances or friction between them in a regular succession of impulses and decompositions, which, if started with sufficient energy, are of such intense heat and velocity that the rupturing force of the explosive is developed practically instantaneously. This detonation has already been shown to be not only the result of mechanical force, but a combination of extremely sudden chemical and dynamical reactions which set up vibrations to which different powders are more or less susceptible, and these explosive reactions will be propagated through the mass of the powder according to the intensity of the vibrations and the resistance with which their motion is opposed by the nature and consistency of the powder, whether it be difficult or easy to oxidize, soft and plastic like dynamite, or hard. If the initial detonation of the powder surrounding the cap is of the highest degree, the vibrations will be most intense and will be propagated further through the mass than by a poorer detonation. Hence the different degrees of detonation. Unless the first particles of powder are so thoroughly decomposed by a detonation of high order, or first degree, as to convey the necessary heat and energy to detonate the whole charge, the greatest force of the powder will not be developed. There will frequently be unbottomed holes or pieces of unexploded powder scattered about, or both, and the air in the mine will be contaminated with some obnoxious gases that have not been completely oxidized.



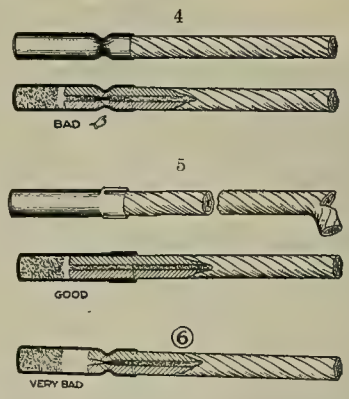
The accompanying illustrations are from cross-sections of explosions in solid lead cylinders, and represent graphically the difference in force developed. Fig. 13 is a good detonation from a strong cap. Fig. 14 is a poor detonation from a weak cap in the same quantity of powder.

Some powders may lose as much as 20% of their effectiveness unless fired with a suitable cap. No. 1 dynamite poorly detonated is less effective and more obnoxious than No. 2 dynamite thoroughly well detonated.

A good rule is: "Better to use a cap of a grade too strong than a grade too weak." The strongest cap is always best adapted to the longest hole, and other varying conditions about a mine, and is therefore the most economical.

It is customary to speak of caps as being of different degrees of strength. This is correct, but bear in mind that it means more than the mere mechanical force attained by different quantities of any particular detonating substance. It is the power or ability of that detonating substance by its peculiar dynamical and chemical nature instantly to transform an explosive into a state of great energy, and it has been shown in the early part of this paper that equal parts of some detonating substances possess this power immensely more than others.

Different brands of blasting caps contain different detonating mixtures, but they are supposed to be numbered or graded according to their detonating power, regardless of the weight of explosive which they contain. It was the custom in early days of dynamite to grade caps according to the weight of straight fulminate of mercury which they contained, because Nobel, the discoverer, found that a gun or rifle cap, which contained only half a grain of fulminate, would partially explode straight nitro-glycerine, and that its explosive force was increased in proportion to the increased weight of fulminate up to 5 grains, which seemed to get the maximum energy out of this particular explosive. But other explosives required still more fulminate, some up to 30 grains or more, according to the length of charge to be detonated. Whenever fulminate of mercury is used, it must be incorporated with other ingredients to make the cap safe to handle. Some of these ingredients lessen its detonating effect, others intensify it, so the effects from given weights of fulminate have always been referred to as standards for different grades.



Though desirous of avoiding reference to any particular brand of caps, it is well to emphasize the fact that as their cost is small compared with the cost of drilling and preparing holes, none but the very strongest and best detonators should be employed. Consider first the powder and conditions under which it is to be used, then select a detonator which will develop the greatest energy out of that particular powder under these conditions. Properly made detonators, if not tampered with, should be safe to handle regardless of their strength.

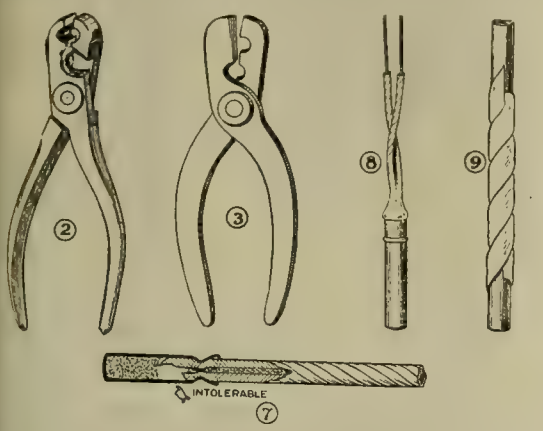
Electrical fuses or exploders are for firing blasts by electricity. This method is of advantage when a number of shots can be fired simultaneously, as by firing them all at once the entire combined strength of the explosive is utilized. It is also commendable because of its safety and certainty of action in submarine work, wet shafts, and other places. Electrical fuses are built into the blasting caps and form a part of them. (Fig. 8) They are sealed up air-tight and are as nearly water-proof as such things can be made without expensive rubber insu-

*A paper read before the California Miners' Association and published by the California Cap Company.

lation, but when handled with ordinary care may be used freely under water, except when very deep, in which case they require special insulation and reinforced cartridges.

No blasting cap, unless it be a wet one, will fail to explode if fire reaches it, and there is no reason why the fire should not reach it if the fuse is good and has been properly handled. Nevertheless, cap manufacturers, like other manufacturers, are blamed for failures in blasting and are called upon to investigate complaints, but, as a rule, the difficulties are traced to improper handling by the operator, generally unintentionally, sometimes through lack of proper instructions. By way of illustration, the following instances have been noted and their remedies suggested:

Caps have failed to explode although the fuse had apparently burned all right. Upon investigation it has invariably been found that the fuse had not been put all the way into the cap and it had been crimped hard near the end with one or other of the objectionable tools which make a groove around the shell and had choked the fire in the fuse so that it could not spit into the cap. (Fig. 6) Upon removing the old fuse and putting a fresh piece



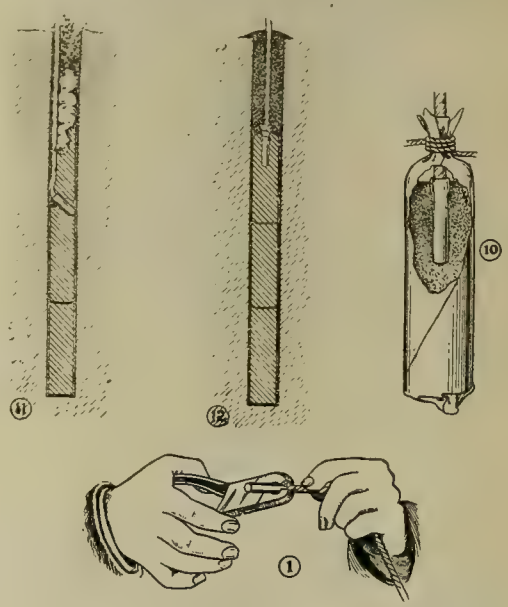
into the same caps which had failed before, but crimping them with a broad-faced tool, every one has exploded. Hence, to avoid choking the fire in the fuse, always see that the fuse is pushed down into the cap as far as the composition and secured to the cap with a broad tool, making the flat compression around the shell. (Fig. 5) Avoid thin crimpers, which make a groove around the shell. (Fig. 4)

Why does a tool which makes a groove around a shell frequently choke the fire in the fuse, or cause the fire instead of spitting into the cap to break out through the fuse just above the cap? (Fig. 4) The familiar Chinese fire-cracker will serve as an illustration. It is a core of meal powder rolled up in many layers of paper and choked at the bottom. The burning powder reaches this choke and can get no farther, so it takes the line of least resistance, bursts through the side of the paper and makes the desired report. So it is with fuse; the choke weakens or stops the fire, according to how hard it is crimped and how near the choke is to the extreme end of the fuse. A broad crimper cannot choke the fire because it acts similarly to a vise, and any good fuse will burn through a pressure of 300 lb. in a vise.

There are a great many more tools on the market which have the thin crimping part than have the broad. The thin ones (Fig. 3) have been cheaper to get up, hence find a market, but invariably wherever replaced by a broad tool the most frequent source of misfiring has ceased. Why buy a poor tool and take such chances when 50 cents at most will buy a better and more practical tool?

Miners should be cautioned also about some combination crimpers and fuse cutters, because although many have the broad crimper, in some it is placed behind the cutting part. This is not a good arrangement, because the cutter comes in the most convenient place to nip the cap with when in a hurry and being sharp, not only makes a groove part way around the shell, but also breaks the shell and lets water into the cap. Bad results have been traced to this very thing; hence, operators desiring combination tools should be particular to use only those which have the cutter behind the crimping part. (Fig. 2) The broad crimper without any cutter is recommended because there can then be no mistakes made. Either a pocket knife or pruning sheares make good fuse-cutters.

When the use of a crimper is suggested to some miners,



or when they hear of misfiring being caused by poor crimpers, they smile and tell how they get along by merely biting the cap to the fuse with their teeth. This is a crude method, but a positive admission of the necessity of fastening caps some way, or else these fellows would not take such a risk of putting dangerous things in their mouths. They also admit of occasional misfires due to caps slipping away from the fuse when they didn't bite hard enough, perhaps, and all are familiar with 'miners' headaches,' taking them as a matter of course, even after losing time waiting for noxious gases to clear after firing; hence these blasters have all this time unconsciously not been getting the best results out of caps and powder, because good crimping not only secures the position of the cap and keeps dampness out, but also serves as additional confinement to the fulminate, thereby developing greater power from the cap, which, as has already been shown, produced a correspondingly increased result from the powder.

Other instances of complaint have been noted where the end of the fuse inserted in the cap had become damp. It had burned apparently down to the cap, but in so doing had forced the hot moisture into the cap, thereby not only moistening the fulminate, but weakening the spit of the fire from the fuse. Damp fuse has been observed to burn a few feet and then slow down or hang fire and sometimes to go out. Cutting off the burned part immediately and re-lighting, the remainder burned a few inches and again went out, and so on through the whole length, showing conclusively that the heated dampness steamed the powder enough to weaken, and at times to

put out, the fire. The remedy is as follows: Fuse should not be left lying around in a damp place; but if it has had to be for a short while, cut off a few inches and throw the piece away, or, having cut off the desired length for the hole, always put the freshly cut end into the cap. Of course, caps must be kept dry also.

The question has been asked, "Why should fuse so well protected with waterproof covering dampen so readily?" Because the meal powder in the fuse is hygroscopic, drawing moisture from the atmosphere. Also, the yarn core along which the powder is strung is dry and spongy, so that both the powder and yarn will draw moisture a long way into the fuse. That this moisture is driven ahead of the fire in the fuse, steaming and weakening it, has been demonstrated in still another way by placing one end of the damp fuse in a cold glass tube and observing the large amount of water vapor condensed in the cold tube. Dry fuse will spit fire several inches into the tube and the glass will be comparatively free from water, but damp fuse will only spit very weak fire, if any at all, and the cold glass tube will be wet with drops of condensed steam from the fuse, the amount of moisture increasing with the length of fuse burned.

In other instances blasters have smeared double-tape fuse with vaseline, others with axle grease or crude oil, when working in wet ground, intending to make it waterproof, and these oils being solvents of tar had penetrated through the tar into the core of powder in the fuse and spoiled it. The quantity of volatile tar products from the burning fuse may also be observed in the glass tube mentioned above by a brown stain which their condensation will make. Soap, clay or tallow will protect the fuse for a short time, but these occasionally get chafed off when pushed into the hole or during tamping. Candle grease is often used and is efficient, but care must be taken not to apply it too hot. The safer and better way in such cases is to use triple-tape or other waterproof fuse in wet ground, and secure the cap with a broad crimper, or wrap about four inches of electricians' adhesive tape over the junction of cap and fuse. (Fig. 9) In very wet ground it is often expedient to use electrical exploders. (Fig. 8)

Unbottomed holes, 'sinkers' and premature blasts are sometimes complained of. These have been found to be cases either of using too low a grade of cap for a particular kind of powder, spoiled powder, uncareful loading, or hole cut off by a previous shot.

The proper choice of detonator will remedy the first cause: 3x or 4x caps are recommended for straight dynamites when not frozen; 5x, 6x or 'lions' for gelatine dynamites, chlorate mixtures and all other inert powders. In cold weather, nitro-glycerine powders become less sensitive; the strongest cap is then especially recommended, as it will get most work and least fume out of any powder, even under unfavorable conditions.

The second cause requires more careful storage of powder. Nitro-glycerine evaporates perceptibly at a temperature of 100°, so that the powder will become weakened and inert. It freezes at about 42°, becoming hard, inert and dangerous. In a damp place it will absorb moisture, which displaces the nitroglycerine, and if stored there for any length of time will become spoiled. Hence dynamite should be soft and dry, stored in a dry and cool place.

As for the third cause, premature blasts, smoky blasts, and weak shots frequently result when the cap is buried way down in the mass of the charge, because the fuse in burning down, and before reaching the cap, may prematurely ignite the powder by side spitting or even by its own heat, and burn up part of it before the rest explodes. (Fig. 11)

Even in preparing a short piece of cartridge as a primer it is bad practice to push any of the fuse into the powder, especially if it is cotton covered, as this absorbs nitroglycerine rapidly, which, if injected into the cap, greatly weakens its explosive force, and sometimes causes misfire.

Side spitting is not always the fault of the fuse. In rough handling it may have become kinked and the tape cracked or weakened at that place so that it blows out of the side of the fuse. Hence, never bury a cap and fuse beneath several sticks of powder. The cap must, however, be in actual contact with the powder, hence the advisability of always tying the cap and fuse into the last stick of powder placed in the hole (Fig. 12), so that the powder cannot slip away from the cap, in which event there would either be tamping or an airspace between the cap and charge, both of which cause mis-shots or bad fumes in the mine, because when the cap gets separated from the powder it cannot possibly exercise its full detonating effect.

In view of the importance of the facts which have been brought forward, a summary is offered, not with a desire to dictate hard and fast rules to those who are breaking ground nearly every day of their lives, but in the form of brief and specific suggestions to insure more thorough detonations of powder and best results.

First—Select the right fuse for the kind of work, and proper caps for the kind of powder in use, and see that both are thoroughly dry.

Second—Powder must not get shaken out from end of fuse, nor sawdust or other obstruction get in between fuse and cap composition. Cutting fuse slanting not only allows a little of the powder to shake off, but often makes an obstruction to the fire because the slender end may fold under. (Fig. 7) Also a sharp-pointed piece of fuse is not a desirable thing to thrust into any cap.

Third—Cut the fuse straight across, not slanting, and push it into the cap half an inch or more, all the way down to the powder. (Fig. 5) If the fuse be ragged at the end or too large to easily enter the cap, never peel off any of the tape or yarn, but swage the end of the fuse to the proper size. This may be easily and quickly done by twisting and squeezing the large part with the crimper (Fig. 1), if it be a broad one. Having inserted the fuse, squeeze the shell tightly to it with a broad crimper placed around the shell so that one side just overlaps onto the fuse. This will make a compression about a quarter of an inch wide around the extreme upper end of the shell.

Fourth—The blasting powder should not be cold, much less frozen, and holes should be carefully charged, squeezing each cartridge separately with a wooden rammer so as to completely fill the hole to the desired height.

Fifth—Having crimped the cap securely to the fuse, insert all of the cap—but none of the fuse—into a stick of powder and tie together (Fig. 10); then put this priming stick upon the rest of the powder in the hole (Fig. 12) and do not ram it until some loose sand or other tamping has been put in. Use tamping without any sharp rocks in it so as not to damage the fuse.

Sixth—Wherever a whole blast may be fired at once, and for all work in very wet places, electrical fuses will be found of advantage.

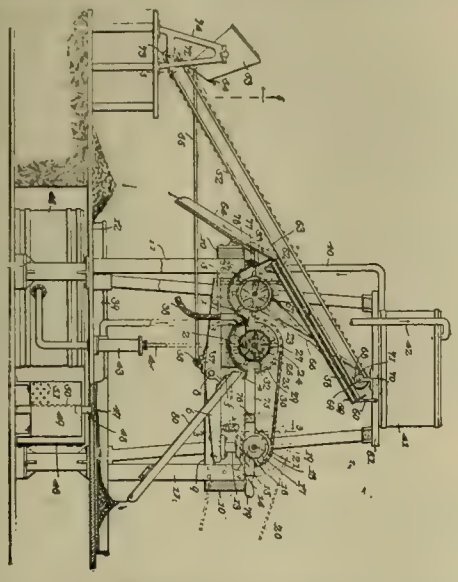
In conclusion, it is hoped that the subject of detonation as applied to the common blasting explosives has been made more clear and that the facts which have been brought forward show how detonating caps determine the value of the blasting powder which they are used with, and also that oftentimes the fuse, caps and powder are unjustly blamed, whereas if the operator attends more closely to the apparently insignificant, but very essential details referred to, many fruitful sources of danger, as well as much trouble, worry and expense, would be avoided.

MINING AND METALLURGICAL PATENTS.

Specially reported for the MINING AND SCIENTIFIC PRESS.

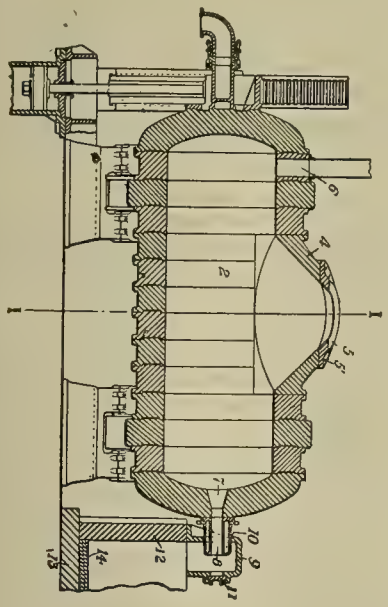
ORE-SEPARATOR.—No. 829,959; William B. Frantz, Lansing, Kansas.

In an ore-separator the combination with a rocking frame and a trough supported thereby; of a rotatable polygonal wheel, a column supported by the frame, a cushion thereon contacting with the wheel, said wheel adapted to vibrate the column and frame, and a trough carried by the frame and movable therewith.



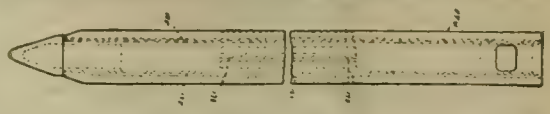
METHOD OF SMELTING ORES AND SEPARATING MATTES.—No. 830,040; Ralph Baggaley, Pittsburg, Pennsylvania; Charles M. Allen, Lo Lo, Montana; and Edward W. Lindquist, Chicago, Illinois.

The method of separating matte, which consists in supplying molten matte and ore to a converter, blowing air therethrough, and discharging the resultant matte and slag into a separate chamber and therein separating the matte from the slag.



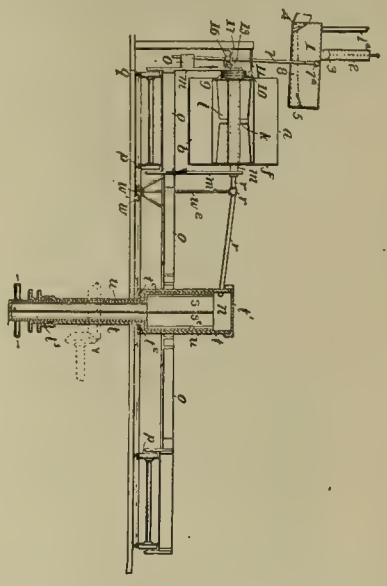
SPUD FOR DREDGES.—No. 830,079; George W. King, Marion Ohio.

In a dredge of the character described, a hull having spud-guides provided with wearing-plates along the margins of their opposite faces, in combination with a spud consisting of a box-girder with recessed sides, said spud having angle-bars secured thereto and presenting guiding-surfaces to co-operate with the wearing-plates of the guides.



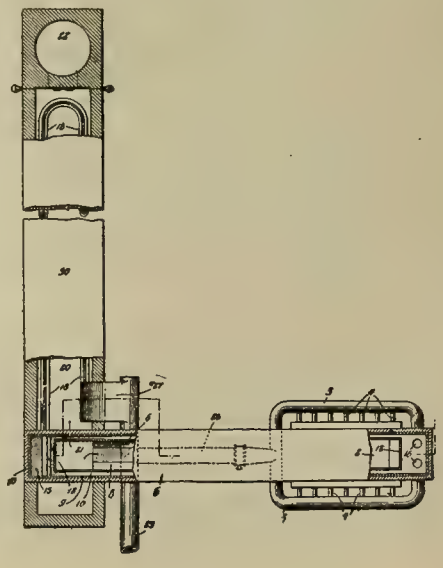
APPARATUS FOR TREATING SLIMES AND SIMILAR MATERIALS.—No. 830,388; William T. Weekley, Kalgoorlie, Western Australia.

The combination of a frame having thereon an upper filter-tray and a lower filter-tray, and means for transposing the trays at intervals to drop material from the first-named tray.



HOT-AIR SYSTEM FOR BLAST-FURNACES.—No. 830,152; Thomas Kiddie, Ladysmith, Canada.

In a device of the class described; the combination with a blast-furnace flue or dust-chamber, of a thin metal pipe extending lengthwise therein, such pipe having in cross-section a width relatively less than its depth and a downward-sloped upper side, means providing for the longitudinal expansion and contraction of the pipe, means for admitting the air of the blast into the pipe at one end, and means for delivering the heated air to the furnace from the other end.



Aspco.

Nitro-glycerine compounds for blasting were introduced in the mining industry nearly forty years ago. They were not kindly received by the miners generally, nevertheless their superiority as a blasting agent was quickly recognized and black powder soon became a thing of the past in most mines. Nitro powders had many things to recommend them. They were compact, they were surprisingly powerful in rending rock, and, on the whole, they were vastly superior to black powder. They were made of varying degrees of strength, from practically pure nitro-glycerine, extremely dangerous to handle, down to the well known 'low powder' used in outside heavy work. Nitro powders became popular, and they are today the most extensively used of any blasting compounds in the world. But the miner, while appreciating the value and convenience of the various makes of nitro-glycerine compounds, such as Giant, Hercules, Judson and a dozen other kinds, is equally wide awake to their disadvantages. He knowns they are extremely dangerous to handle; that they freeze at a comparatively moderate temperature –40° F, and that their explosion fills the mine workings with fumes of nitrous oxide, which are not only disagreeable, but deadly if inhaled in large amount. A moderate dose of ' powder smoke' gives the unfortunate who breathes it a splitting headache, which no amount of medicine can remedy; the victim must have hours of sleep and rest before he is free from the evil effects of the powder gas, for most of the remedies recommended for ' powder head ' are as bad in their effects as the nitrous oxide, being ruinous to stomach and nerves alike. There is also that nemesis of the miner—the missed hole. How many a good man has come to his end in the prime of health, with apparently years of usefulness ahead of him, by drilling or picking into a missed hole. Often a miner is heard to say, after one of these sad accidents, which has taken one or more of his comrades : " If we could only get a powder that is the equal of dynamite, without its fumes and danger in handling ; that won't freeze and is as easy to use as nitro-powder; but I guess we want too much." Not at all. There is just such a blasting compound now being placed upon the market, an innovation in high explosives. One that is perfectly safe to handle, lighter in weight, bulk for bulk, than any dynamite ; it won't freeze, nor melt at any atmospheric temperature. A rifle-ball can be shot into a box of it with perfect safety ; it leaves no noxious fumes of any kind, and the miner can return to the face of a close drift immediately after blasting without encountering deadly gases, or running danger in any way ; and if there has been a missed hole, all he has to feel concerned about is the detonating cap, which is the only thing that will explode this new product. The hardest granite or greenstone, the softest sandstone or shale, are blasted by it with equal facility. For ' bulldozing and ' block-holing' it has no equal. It simply rends a rock into fragments fracturing it in all directions in a most remarkable manner. Mysterious and difficult of explanation are the physical demonstrations and potentialities of this most modern explosive. Considerable exploitation of this new powder has been made within the past two months at Los Gatos, San Jose, and Berkeley, California, one of the most notable ones of recent date, having taken place on September 21, at Berkeley in the presence of a large number of mining and scientific people, well known on the Pacific Coast.

This new explosive has been named ASPCO, a trade name distinctively characteristic, and suggestive of the manufacturer, The American Safety Powder Co., a California corporation, composed of men identified with the mining industry. An economic feature of ASPCO is the fact that it can be shipped at merchandise rates, which will very materially reduce the item of mining costs. George W. Myers of Berkeley, California, for several years the Coast representative of Masurite, a safety powder with an excellent Eastern reputation, has been appointed the contracting agent for this twentieth century product

Books Received.

THE PROSPECTOR'S FRIEND is the title of a little book issued by the Way's Pocket Smelter Co., of South Pasadena, California. It contains a description of the Way ' tablet,' used in making metallurgical determination of ore, and other information useful to the prospector. The tablet is said to operate satisfactorily on the ores of gold, silver, copper, tin, lead, zinc, etc., and the determinations are quickly made.

COBALT AND ITS SILVER MINES, is the title of a well-illustrated book by W. S. Bullock, 25 Broad street, New York City. Cobalt has probably attracted more attention than any other one mining camp in the world during the current year. This work describes and illustrates the mines and gives much valuable information about the district, the mining laws, and a list of the most important companies operating there. Price, 25 cents.

From the UNITED STATES GEOLOGICAL SURVEY, Professional Paper No. 50. The Montana Lode of the Keewatin Ice Sheet, by Fred H. H. Calhoun; Bulletin 275, State Deposits and Industry of the United States; No. 277, Mineral Resources of the Kenai Peninsula, Alaska; No. 278, Geology and Coal Resources of the Cape Lisburne region, Alaska; No. 280, The Rampart Gold Placer Region, Alaska, by L. M. Prindle and Frank L. Hess; No. 281; No. 282, Oil-fields of Texas and Louisiana; No. 288; No. 291, A Gazeteer of Colorado; also water supply papers No. 155, 156, 158, 163, 173, 176, and 178.

Commercial Paragraphs.

THE CHICAGO PNEUMATIC TOOL CO. has opened an office at 1012 Memphis Trust Bdg., Memphis, Tenn., in charge of J. Francis Small.

HARRON, RICKARD & MCCONE have established their headquarters at 316 Market St., San Francisco. The warehouse at 7th and Berry St. will be retained as heretofore.

The newly designed SIMPLEX CONCENTRATING TABLE, manufactured by the Colorado Iron Works Company, has a strong, easily adjusted, differential motion, that imparts the proper impulse to the ore along the riffles, and the stroke may be readily shortened or lengthened according to the speed at which the pulp is required to travel toward the discharge. A highly silicious ore that requires longer time to stratify, needs the slower motion obtained by the shorter stroke. The table has three decks, each deck having a riffled rubber surface, and each deck may be independently adjusted as to side slope. This enables the operator to gauge and control the flow of the gangue over the riffles, making it as rapid as possible without carrying the mineral over with it. Each deck is a separate concentrator and may be adjusted to suit its own work.

AMONG the orders for machinery reported booked by the POWER AND MINING MACHINERY CO., Cudahy, Wis., may be mentioned the following: Twenty-four sets of 36 by 16 in. crushing rolls, and four sets of 54 by 20 in. crushing rolls for the Utah Copper Co., Garfield, Utah; three additional converter stands and nine shells for the Detroit plant of the Copper Queen Con. Mining Co., at Morenci, Arizona; eleven 6-ft. Chilean mills for the Real del Monte y Pachuca, Pachuca, Mexico; six 6-ft. Chilean mills for the Golden Cycle Mining Co., Colorado City, Colorado; sixty agitators for the United States Mining Co., Salt Lake City; three 48 by 240 in. water-jacketed copper furnaces for the British Columbia Copper Co., Greenwood, B. C.; three 56 by 240 in. water-jacketed copper furnaces for the Balaklala Con. Mining Co., Redding, Cal.; two 46 by 162 in. copper and lead furnaces for the Oaxaca Smelting & Refining Co., Oaxaca, Mexico; one 56 by 180 in. water-jacketed copper furnace for the Arizona Smelting Co., Humboldt, Arizona; two converter stands, electrically driven, and four shells 96 by 108 in.; also five 10-ton matte ladles, for the Selby Smelting & Lead Co., South San Francisco; four converter shells, 84 by 126 in., for the Colusa Parrot Mining & Smelting Co., Butte, Mont.; two converter shells, 84 by 126 in., for the Shannon Copper Co., Clifton, Arizona.

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Editorial.

IN THIS ISSUE we publish a description of shaft-sinking as accomplished with small drills at the North Star mine. The details given by Mr. Arthur B. Foote, assistant superintendent of the mine, will be welcomed by practical men. One of the important economic gains made in mining during the last two or three years has been through the use of small one-man drills for stoping and even, as in this case, for shaft-sinking, in place of the big machines that require two men. The successful use of the small drills is dependent upon the character of the rock and, where that is neither excessively tough nor unusually soft, the only way to find out whether small machines can be substituted for the big ones is to make a trial under careful supervision.

THE TWO ARTICLES on the treatment of ore at the Combination mine will be appreciated by millmen. Mr. Francis L. Bosqui has described the development of the existing process of treatment through a succession of tests and trials from the very start, as the mine grew and the ore changed from an oxidized to a sulphide condition. This account of the practice and of the metallurgical principles involved has more than a local application, for high-grade quartzose gold ore of the same character is being found in many of the new districts of Nevada, the output of rich silicious material at the present time reminding one of the palmy days of Cripple Creek, when the smelters in Colorado became short of the lead and copper ore required for a good smelting mixture. We look forward to the completion of the San Bruno plant, at San Francisco, since these large reduction works will afford a market for the output of the Nevada goldfields, to be smelted with the copper matte from Shasta.

AS WE HAVE SAID on other occasions, this journal has nothing to do with politics, but it takes a keen interest in all that makes for good citizenship. It is a pleasure, therefore, to give a page to an extract from the notable address delivered by the President at Harrisburg. To those who may feel depressed at the general evidence of corruption in politics and in business, the President's appeal to the manhood of the country comes like a bugle call at dawn, awakening all the true patriotism and civic pride of the American people. As the MINING AND SCIENTIFIC PRESS finds many readers in countries outside the United States, it is gratifying to afford them an opportunity of reading the vigorous utterances of our Chief Executive, and when they read them, they are likely to realize that we have something more than an industrial community intent solely on the making of money. To Americans abroad, especially to our engineer friends in distant lands, the stirring notes of the President's address will come as a message from home.

Prevention of Fraud.

The most important topic of discussion on the program of the American Mining Congress, which meets at Denver next week, is the prevention of fraud in mining. It is proposed to draft a law for the protection of investors and the punishment of those who, under cover of mining operations, carry on a predatory business among the inexperienced. In this matter California has led the way, for the last Legislature passed an act, which has now become a law, making willful misrepresentation a felony, punishable by imprisonment, or fine, or both. It is claimed, with good reason, that California is comparatively free from the more vicious forms of mine promotion, and some of those in authority credit this honorable condition of affairs to the existence of punitive legislation. We would be glad to believe this, but, to be frank, we think it to be traceable to the absence of any speculative excitement in the western foothills of the Sierra Nevada. Fraud travels in the dusty wake of a boom and flourishes in the warm air of wild speculation. In Nevada there is lots of it just now, so also at Cobalt, in Ontario, not because of any particular depravity in the people on the deserts of the Great Basin or in those who dwell among the resplendent lakes and forests of Canada, but simply because the haste to get rich quickly deludes the victims that are sacrificed to financial piracy. In California mining is prosperous in a quiet and orderly way, the stock exchanges do not quote the shares in her productive mines, they belong to persons who are willing to hold their property and to work it, instead of the public. If any extraordinary discoveries, especially in a new district, were to be made, it is likely that even our people might take a hand in that game of mining speculation where the 'ante' is high, the play without a 'limit'—and the promoter takes the 'kitty.' It is notorious that new camps are the favorite breeding ground of fraudulent schemes. It is intended to hinder these, if not to suppress them, so that the widows and orphans, the simple and the greedy, may be protected. This is excellent, and we entertain no doubt but that the public discussion of the matter will be beneficial—even more beneficial than the proposed legislation. It is not special legislation that is required so much as the enforcement of that already enacted; there are plenty of laws on the subject, but they lie neglected, because it is difficult to determine at what point a man ceases to express his honest opinion and begins to act in bad faith. Moreover, the truth as to the condition of a mine is hard to ascertain, when anyone is bent on obscuring the facts. The American Mining Congress has undertaken to furnish investors with information about mines and to place the industry "on an investment rather than a speculative basis." Both these departures are well meant, but they are not to be taken seriously. Accurate information concerning a mine is only to be got by sampling and careful investigation, and everyone ought to know that the Congress can do no such work unless it is prepared to pay for the services of a corps of engineers, like those the exploration companies find it necessary to retain. Any opinion based on second-hand and gratuitous information is worth usually what it costs—nothing. As to mining being an investment and not a speculation, that is a fallacy of the first water, which it is easy to disprove. How many men would be willing to put their mining scrip in a safe and lock it up for five years, or even five months? Mining is a speculation, with the possibility of gains that warrant the risks; it needs no apology, and benefits not at all by being misrepresented.

We believe in two methods of stopping fraud in mining; the first is to prevent the misuse of the mails, and the other is an enlightened public opinion on the whole subject of mining speculation. The post-office inspectors are to be credited with two notable convictions — that of Letson Balliet and that of G. W. Rumble, and with much other useful work besides. To land such men in the penitentiary is difficult and it is expensive, but it is worth to the community all that it costs. We hope to see the postal authorities encouraged in their activity in this regard, and we consider that one of the most practicable ways of achieving the purpose under discussion would be to increase any appropriation that is made at Washington for rigid control of the mail service, to the end that a great public utility may not be put to base ends. This should apply especially to the newspapers that are made the medium for advertising fraudulent schemes. Next, we believe in the creation of an intelligent public opinion in these matters. Laws are bound to lie unheeded unless the community thinks strongly in regard to the infraction of them; there is no judge or jury that is insensitive to public sentiment. Therefore, let the widows and the orphans, the foolish and the needy, be informed that mining speculation is risky, particularly when undertaken without advice, that vultures are not rare birds, and that people who expect to make a dollar by placing ten cents must not whimper if they see their coin swept off the board. Moreover, let it be recognized that newspapers and journals which denounce mining frauds on their reading pages and advertise others just as bad on their advertising pages, are playing a double game. It is curious, it is even more than a coincidence, that the mining schemes which are advertised on the outside of such papers are never attacked on the inside pages. Again, let the poor widows and orphans, the gullible and the gambler, be informed that the photographic presentments of the organizers of mining companies do not indicate anything in particular. Why a promotor should think that his picture, even if he be handsome, should be accepted as proof of his honesty or of the richness of his hole in the ground, is for someone to explain. In general, the children in finance had better avoid companies that ask for support on the basis of such pictorial suggestion. There are many things that the Mining Congress can say authoritatively, and there is a lot of illumination that it can shed over the by-paths of predatory enterprise. Mining is good enough to stand the truth; when properly done it is the most profitable form of industrial activity, and it will do no harm to divert some of the capital wasted on hopeless holes to the development of sound undertakings. Every dollar misspent is so much lost to the fund that develops the real mineral resources of this country.

By the Way.

At the dedication of the new Capitol of the State of Pennsylvania, at Harrisburg, on October 4, the President, Mr. Theodore Roosevelt, said:

We can show that the past is with us a living force only by the way in which we handle ourselves in the present, and each of us can best show his devotion to his own State by making evident his paramount devotion to that Union which includes all the States. The study of the great deeds of the past is of chief avail in so far as it incites us to grapple resolutely and effectively with the problems of the present.

We are not now menaced by foreign war. Our Union is firmly established. But each generation has its special and serious difficulties, and we of this generation have to struggle with evils springing from the very material success of which we are so proud, from the very growth and prosperity of which, with justice, we boast. The extraordinary industrial changes of the last half-century have produced a totally new set of conditions, under which new evils flourish, and for these new evils new remedies must be devised.

Some of these evils can be grappled with by private effort only, for we never can afford to forget that in the last analysis the chief factor in personal success—and, indeed, in national greatness—must be the sturdy, self-reliant character of the individual citizen. But many of these evils are of such a nature that no private effort can avail against them. These evils, therefore, must be grappled with by governmental action. In some cases this governmental action must be exercised by the several States individually. In yet others it has become increasingly evident that no efficient State action is possible, and that we need, through executive action, through legislation, and through judicial interpretation and construction of law, to increase the power of the Federal Government.

If we fail thus to increase it, we show our impotence and leave ourselves at the mercy of those ingenious legal advisers of the holders of vast corporate wealth, who, in the performance of what they regard as their duty, and to serve the ends of their clients, invoke the law at one time for the confounding of their rivals, and at another time strive for the nullification of the law, in order that they themselves may be left free to work their unbridled will on these same rivals, or on those who labor for them, or on the general public.

In the exercise of their profession and in the service of their clients astute lawyers strive to prevent the passage of efficient laws and strive to secure judicial determinations of those that pass which shall emasculate them.

They do not invoke the Constitution in order to compel the due observance of law alike by rich and poor, by great and small; on the contrary, they are ceaselessly on the watch to cry out that the Constitution is violated whenever any effort is made to invoke the aid of the National Government, whether for the efficient regulation of railroads, for the efficient supervision of great corporations, or for efficiently securing obedience to such a law as the national eight-hour law and similar so-called 'labor statutes.'

The doctrine they preach would make the Constitution merely the shield of incompetence and the excuse for governmental paralysis; they treat it as a justification for refusing to attempt the remedy of evil, instead of as the source of vital power necessary for the existence of a mighty and ever-growing Nation.

All honest men must abhor and reprobate any effort to excite hostility to men of wealth as such. We should do all we can to encourage thrift and business energy, to put a premium upon the conduct of the man who honestly earns his livelihood and more than his livelihood, and who honestly uses the money he has earned. But it is our clear duty to see, in the interest of the people, that there is adequate supervision and control over the business use of the swollen fortunes of today, and also widely to determine the conditions upon which these fortunes are to be transmitted and the percentage that they shall pay to the Government whose protecting arm alone enables them to exist. Only the Nation can do this work. To relegate it to the State is a farce, and is simply another way of saying that it shall not be done at all.

Under a wise and far-seeing interpretation of the interstate commerce clause of the Constitution, I maintain that the National Government should have complete power to deal with all of this wealth which in any way goes into the commerce between the States—and practically all of it that is employed in the great corporations does thus go in. The national legislators should most scrupulously avoid any demagogic legislation about the business use of this wealth, and should realize that it would be better to have no legislation at all than legislation couched either in a vindictive spirit of hatred toward men of wealth or else drawn with the recklessness of impracticable visionaries.

But, on the other hand, it shall and must ultimately be understood that the United States Government, on behalf of the people of the United States, has and is to exercise the power of supervision and control over the business use of this wealth—in the first place, over all the work of the common carriers of the Nation, and in the next place over the work of all the great corporations which directly or indirectly do any interstate business whatever—and this includes almost all of the great corporations. The Government ought not to conduct the business of the country; but it ought to regulate it so that it shall be conducted in the interest of the public.

It behooves us Americans to look ahead and plan out the right kind of a civilization, as that which we intend to develop from these wonderful new conditions of vast industrial growth. It must not be, it shall not be, the civilization of a mere plutocracy, a banking-house, Wall-street-syndicate civilization; nor yet can there be submission to class hatred, to rancor, brutality, and mob violence, for that would mean the end of all civilization. Increased powers are susceptible of abuse as well as use; never before have the opportunities for selfishness been so great, nor the results of selfishness so appalling; for in communities where everything is organized on a merely selfish commercial basis, such selfishness, if unchecked, may transform the great forces of the new epoch into powers of destruction hitherto unequaled.

We need to check the forces of greed, to insure just treatment alike of capital and of labor, and of the general public, to prevent any man, rich or poor, from doing or receiving wrong, whether this wrong be one of cunning or of violence. Much can be done by wise legislation and by resolute enforcement of the law. But still more must be done by steady training of the individual citizen, in conscience and character, until he grows to abhor corruption and greed and tyranny and brutality, and to prize justice and fair dealing.

The men who are to do the work of the new epoch must be trained so as to have a sturdy self-respect, a power of sturdy insistence on their own rights, and with it a proud and generous recognition of their duties, a sense of honorable obligation to their fellows, which will bind them, as by bands of steel, to refrain in their daily work at home or in their business from doing aught to any man which cannot be blazoned under the noonday sun.

Special Correspondence.

London.

Siberian Ventures are Popular. — Particulars of Some of Them. — Methods of Financing Mines. — The Golden Stream From Australasia. — Impressive Statistics.

Sundry reports and particulars concerning Siberian ventures have furnished the financial and mining press with a supply of welcome 'copy' during the slack holiday season. The industry is assuming considerable proportions, the promoting groups having been able to attract to their side names which stand well in both financial and social circles. As ground-work for future reference it will be useful to glance briefly at the various organizations in the order, as may be practicable, in which they have come into public notice. The Siberian Syndicate, Ltd., the shares of which have just been introduced on the market, has a nominal capital of £100,000, in 100,000 shares of £1 each. There are issued 50,000 shares, of which 8,574 shares are fully paid and 41,426 have 5s. per share paid up. It is not expected that more than an additional five shillings will be called up this year. The reserve is consequently £50,000, and it is added that "no options exist over these shares." The Siberian Syndicate was formed in June, 1905, to acquire the assets and good will of the previous syndicate of the same name, which had been continuously at work in Siberia since 1902, and which, in July, 1904, floated the Spassky copper mine. The other properties in which the syndicate is interested are stated to be numerous and to cover an enormous area. The principal are known as the Popoff and Atbasar groups of mines, respectively, upon which options have been secured. The Popoff group consists of 59 ore-fields, containing gold, silver, copper, lead, graphite, and coal mines, and two smelting works situated in the Karkaralinsk and Pavlodar districts of the province of Semipalatinsk, on the left bank of the river Irtish, in southwest Siberia. The district is reached from London in about fourteen days. The reports of the syndicate's engineers are necessarily incomplete, in view of the enormous area involved; but, so far, they are considered by the consulting engineers, Pellew, Harvey & Fell, to be of a most encouraging nature. The Atbasar group consists of copper, silver-lead, and coal mines in the Kirghese steppes. The preliminary reports of the engineers on the copper deposits are said to be highly favorable. To allay any uneasiness in the minds of speculators as to the possible effect of the political unrest in the Russian Empire, it is pointed out that the properties in which the Syndicate are interested lie outside the revolutionary area. A proof of this may be found in the fact that the chief police department is so far able to occupy itself with the peaceable ways of commerce as to be in a position to inform the manager of the Spassky Copper Co. that the Government is commencing at once to construct the Orenburg-Amolinsk-Semipalatisk railway. This railway should pass quite close to the Spassky copper and coal mines, and through the properties now being inspected under option by the Syndicate. With regard to the fortunes of Spassky copper in particular, it appears that a leading South African house has sent out its representative to examine it, with the time-honored object, doubtless, of exercising an option on a block of shares if the report is favorable. The story goes that the company — which is protected by an enormous duty on imports of copper into Russia — has recently secured a most advantageous contract to supply 200,000 poods at 16½ roubles, whereas it is estimated that the cost of production will be only about 8 roubles per pood. A further organization has just been formed — Siberian Exploration Syndicate, Ltd., with a capital of £3,000 — by the same group of financiers. A second group is concerned in Siberian Proprietary Mines, Ltd., floated in August, 1903, its first bantling being Orsk Goldfields, noticed in my correspondence of April 18, respecting which the latest news is to the effect that the cost of the new work, so far, has been covered by the profits resulting from the operations of the tributers, leaving the working capital of the company practically intact, the ore won on tribute from nine different veins having yielded, since the property was taken over, an average of about 55s. per ton.

The newest effort of this financial group is the issue of the Troitzk Goldfields, Ltd., with the nominal capital of £600,000 in £1 shares, 500,000 of which credited with 14s. paid up on each share, having been issued to the Siberian Proprietary Mines, Ltd., the vendors, in payment for options acquired over the properties. These 500,000 shares, now paid up in full, will provide £150,000 for the purchase of the property and for working capital, while the remaining 100,000 shares are held in reserve to provide for further exploration and plant. As to the situation of the properties, although on the main Siberian railway, the Preobragensk and Alexandrovsk gold mines are in the northwestern part of the Kotchkar goldfield, in the Orenburg province of southeastern European Russia, 64 miles south of the town of Tcheliabinsk and 49 miles southeast of Bishkil, and consequently in a less isolated position than some of the other mines working in Russia. The Preobragensk mine has been worked by its present owners for about 4½ years, and the Alexandrovsk by its present owners for 25 years. The combined area is about two square miles, the property being held on perpetual lease from the Government. According to a statement by the owners of the Preobragensk mine, it has produced 8,000 oz. gold per annum, and the Alexandrovsk mine has produced an average of 5,000 oz. per annum, making together a gross revenue of about £45,000 per annum, with only a very imperfect system of working in vogue. The present profits are said to be about £25,000 per annum from the two mines. The intention of the company is now to undertake the development and exploitation of the numerous valuable lodes already being worked, simultaneously with a more systematic prospecting of the whole property, and eventually to erect from 150 to 200 stamps to crush about 225,000 tons per annum, it being estimated that the average yield of gold will be about 30s. per ton. As to working costs, John Taylor & Sons, who have reported on the property, estimate that they will amount to about 16s. per ton, but the promoters believe that they will not exceed 12s. per ton, and upon this basis the profit per ton would be about 18s., or £202,500 per annum. The whole of the cash capital has been found by the promoters and their friends, from whom the public are expected later on to purchase the shares at a good premium by "coming in" on the market. Meanwhile it may be observed that although Messrs. John Taylor & Sons have visited the properties in question and reported on the working costs, no statement has been published as emanating from that firm respecting the probable profits. The directors are men of social prominence.

Another financial group has also secured the co-operation of men of high degree in the formation of the Siberian Mines, Ltd. The capital of the latter is £100,000 in £1 shares, of which 7,000 will be issued as fully paid, in part payment for various groups of mines to be acquired, and 92,993 will be allotted to the H. A. Syndicate, credited with 15s. paid, the balance of 5s. per share

representing the cash capital available when called up. The properties to be taken over are stated to be all in the province of Orenburg, and the terms of purchase are so arranged that only small monthly payments are to be made until a full report has been received from John Taylor & Sons, and then, if their report should be satisfactory, the company can work the properties at a small annual rental until it has proved them, and decided to complete the purchase. The company will not itself be so much a mining as a promoting concern. Not one of these various Siberian and allied mining properties has produced as yet any dividend to English stockholders, but the market position of some of them may be gauged from the report this morning in one of the leading financial papers (all £1 shares): "Spassky dipped to 5¼, Siberian Props. were steady at 5 3/16, Orsks at 1 5/16, and Siberian Syndicate at 1½ prem. Siberian Mines were also firm. Troitzk Goldfields 1⅛ to 1 3/16."

Here is a realization of wealth from the other side of the world. Total quantity and value of gold raised in Australia, Tasmania, and New Zealand from the first discovery in 1851 to the end of 1905:

	Quantity. Fine oz.	Value.
Victoria	64,324,197	£273,236,500
New Zealand	15,827,423	67,230,581
West Australia	14,871,687	63,170,911
Queensland	14,601,249	62,022,130
New South Wales	12,534,566	53,235,286
Tasmania	1,294,364	5,498,101
South Australia	594,348	2,523,438
Australasia	121,047,834	£526,916,950

One is reminded of the eloquent popular preacher who extolled the design of Providence in causing the big rivers to flow near the sites of important cities. Truly Britain may thank that Power for depositing such a goodly proportion of the precious ore in a part of the earth's crust possessed by her enterprising sons.

Melbourne, Australia.

The Mt. Morgan Mine and Its Production.—Big Reserves of Copper Ore Under the Gold Gossan.—This Copper Refined in New Jersey.—New Processes at Broken Hill.—The Cattermole Process Doing Well.—Transfer of the Great Cobar Copper Mines.

Before me is the balance sheet of the Mt. Morgan Co., of Queensland, which has recently attained its majority. Its record is one of local unexampled prosperity, yet the State in which it is situated cannot be said to have profited by the discovery. A few people got wealth but the collapse of wild speculation over the shares led for a time almost to commercial disaster. Those who got in early and held their shares have done well. Beginning in 1886 with a dividend of 8d. per share, the company has paid dividends year after year until now the total amounts to £6,679,166. It thus is second only to the Broken Hill Proprietary as a dividend payer. The biggest record was in 1889 when £1,100,000 was distributed in the twelve months. In the following year £700,000 was paid and since then the amount has dwindled until for the last three years the dividends have aggregated £150,000 per annum. The lowest level of the mine is only at 750 ft. below the surface. Hitherto the company has relied entirely on gold for its dividends. Now, however, it is turning its hand to the production of copper. Extensive boring, done with the diamond-drill, has proved the extent of the copper-bearing formation; accordingly, a smelting plant has been erected which is now treating ore carrying roughly 7 dwt. gold and 2½% copper. In the year just ended, one furnace was in commission 131 days and treated 22,153 tons. A second furnace was started late in May and in April converting was begun. The works are now turning out 9½ tons of blister copper per diem, averaging 98.6% copper and 14½ oz. gold per ton. In all probability a couple more furnaces and additional converter plant will be provided. The magnitude of the property can be realized from the fact that the estimates of auriferous copper ore—apart from the gold ore—is 1,212,000 tons, averaging 3½% copper and 8 dwt. gold; 1,597,000 tons worth 3% copper, 2½ dwt. gold; and large unestimated quantities containing from 2 to 3% copper and from 1 to 2 dwt. gold per ton. The Mt. Lyell ore works out at 2.32% copper and a fraction of the above gold contents. The estimate of cost of 35s. per ton for mining, smelting, and realization, is not being exceeded, so it will be seen what a magnificent asset the company has in its copper-gold ore. The company's output of blister copper has been sold for a term to the De Lamar Copper Refining Co., of New Jersey. During the year the company handled 288,353 tons of ore, and 344,162 tons waste. The oxidized gold ore totalled 135,210 tons, averaging 7.82 dwt. and the sulphide gold ore 104,572 tons averaging 10.82 dwt. The fine gold produced during the year was 114,521 oz. Costs at the gold reduction works were 10s. 9d. per ton.

Broken Hill is continuing its experimental work. There are three processes in the field; first, the sulphuric acid process and its rival, the Delprat process; next, the Cattermole process, and, third, the ordinary gravitation process. I have dealt on a previous occasion with the sulphuric acid processes. The Cattermole is a granulation process, and is being tested at the Central mill of the British Sulphide Corporation. The latest figures supplied by the general manager (C. F. Courtney) show that a recovery of 46% zinc has been achieved from the zinc residues and that costs are most satisfactory. This is the best grade zinc concentrate being produced on the Barrier. The company will soon supply zinc concentrate to the Central Zinc Co., England, an off-shoot of the Sulphide Corporation, which has already commenced the erection of works in England. Meantime another furnace will be installed in connection with the company's own spelter plant at Cockle Creek, making three; and possibly a fourth will be put in later. This plant would then, in Mr. Courtney's opinion, be capable of supplying Australia's demand for spelter, which is, as yet, limited. The Sulphide Corporation, he adds, has no intention of giving up the manufacture of spelter, but intends to increase the supply. The spelter process in use at Cockle Creek, near Newcastle (New South Wales), is the Sulman-Picard. The third process is the De Bavay, which is a flotation method dependent entirely on the floatability of particles of zinc sulphide on water and their subsequent collection by gravitation. It will thus be seen that the experiments in respect to Broken Hill zinc sulphides are not only of the utmost importance from a commercial standpoint, but they have high scientific interest.

The final payment has been made in connection with the purchase of the Great Cobar mines, New South Wales. The sum paid for the property was £800,000, and a deposit of £25,000 was paid at the time the option was secured. A check for £775,000 has now been handed to Dr. Read from the Great Cobar, Ltd., of London, which has bought the property of the Great Cobar Copper Syndicate. The properties acquired were the Great Cobar copper mine, the Cobar Chesney copper mine, the Peak and Conqueror gold mines, coal mines at Lithgow, coke works at Rix's Creek, smelters at Cobar, and the copper refinery at Lithgow. J. D. Kendall, representative of the English company, has arrived to take delivery of the properties.

Butte, Montana.

New Company is Organized.—Big Vein Cut by the East Butte.—North Butte Acquires More Territory.—Furnace Creek Operations.—Boston & Montana to Increase Output.—Little Mina to Resume Work.

The Colusa-Leonard Extension Copper Co. has been organized at Butte and incorporated under the laws of Arizona with a capitalization of $5,000,000, divided into 1,000,000 shares of $5 each. The new company owns five patented mining claims on the east side of the Butte district, about 2,000 ft. east of the Minnie Healey, Colusa, and Leonard mines, the northern portion of the Pittsburgh & Montana Co.'s ground lying between. The officers of the company are: O. B. Whitford, president; Meyer Genzberger, vice-president; James A. Talbott, treasurer; Arthur Smith, secretary. The ground is undeveloped, but is considered to be well located in view of its proximity to the big mines of the Boston & Montana Coalition. It is expected that machinery will be on the ground and sinking begun in 30 days.

The Amazon-Butte Copper Co., with a capital stock of $2,500,000, divided into 500,000 shares of $5 each, has been organized and incorporated at Butte, the subscribers being ex-State Treasurer A. H. Barret, George H. Casey, ex-Mayor Patrick Mullins, James H. Lynch, Christian Jacky, General Charles S. Warren, W. F. Cobban, Frank W. Haskins, William F. Love, and Charles Mattison. The company has acquired the Amazon, West Altona, and Gaynor quartz claims, all old patented properties and good prospects; these comprise about 40 acres of ground south and east of the mines of the Pittsburgh & Montana Co., and west of the mines of the Ida-Montana Co., in which latter property a large body of gray copper and copper glance has recently been opened at 100 ft. from the surface. This vein extends through the West Altona and Gaynor, while the large north and south vein of the Bullwhacker extends directly through both the Amazon and West Altona. There was considerable work done on all these claims in past years and good copper ore opened in numerous places along the outcrops. Rich float is found all over the surface, and in the early days several shipments of rich oxidized ore were made at a profit to Corinne, Utah, by team, a haul of several hundred miles. On the Amazon there is a double-compartment shaft 200 ft. deep and in good condition. Machinery is to be placed on this claim and the shaft sunk to 800 or 1,000 ft. as rapidly as possible.

The North Butte Mining Co. has recently purchased two additional mining claims, the Emily and Millview, and acquired all outstanding interests in the Gem and Snowball. The Millview and Emily lie between the Badger State of the Boston & Montana Co. and the Poser and Elm Orlu, owned by W. A. Clark. The Snowball is a narrow fraction adjoining the Berlin of the North Butte and its acquisition completes the ownership of a solid block of claims of about 15 in number.

The East Butte Copper Mining Co. has cut through the vein encountered in the southern cross-cut from the 400-ft. level of the Dutton mine, and the vein is more than 12 ft. wide. Apparently two of the veins worked on the 200-ft. level united below that point and formed the 12-ft. vein on the 400-ft. level. Four feet of the vein carries high-grade copper and the remaining eight feet is good concentrating ore. Work on the cross-cut toward No. 12 shaft, which is being sunk at the southern extremity of the company's ground, is advancing rapidly. Fully a dozen other veins will be opened by this cross-cut. Shaft No. 1 has reached a depth of 530 ft. and No. 12 is down 250 ft. After the company began enlarging and sinking No. 1 shaft, work on the upper levels was stopped. Mining has, however, been resumed on the 200 level and some ore is being hoisted. Large bins are being built on the railroad track and they will be connected by an elevated tramway from No. 1 shaft.

The Lewisohn General Development Co. has purchased a half interest in the Montgomery claim, an east side property, on which a shaft is being sunk to cut the vein recently opened in the Bullwhacker claim, north of the Montgomery.

Donald Gillies, representing the Schwab and Kuntz interests in Nevada and the Furnace Creek district of California, has been in Butte the past week to consult with the directors of the Furnace Creek Extension Copper Co. relative to the proposed merger of all of the big Furnace Creek and Greenwater companies. According to reports from Greenwater the Extension Company has the best showing in that district, and the promoters of the merger are anxious to reach an agreement before proceeding with the negotiations for further territory. John MacGinniss, vice-president of the United Copper Co., and A. J. Campbell, counsel for the Amalgamated Copper Co., are the leading spirits in the Furnace Creek Extension Co. It is understood that the Extension people are willing to go into the merger, it being only a question of terms. The consolidation is to take place in the Furnace Creek Copper Co., Furnace Creek Extension Copper Co., Greenwater & Death Valley Copper Co., and several smaller concerns. The capitalization of the Consolidated Co. will be large, as the property of the Furnace Creek Copper Co. is to go in for $10,000,000, and that of the Extension Co. will be entered for not much less.

Some remarkably good news is being received from the mines of the Butte & Arizona Copper Co., situated about 30 miles from Bisbee. An official report is that the vein of copper cut in the tunnel a week ago, and then reported to be eight feet wide, has widened to 40 ft. No assays accompanied the latest report, but last week the average value given was 7% copper. If the same average still holds in the larger orebody, the company has a remarkably rich find. The principal stockholders of the Butte & Arizona are Butte and Michigan men.——The Butte-Milwaukee Co. has cut another vein in the Pollock mine by an opening from the 250-ft. station. It is the second vein tapped and another is known to exist in the same claim. The extent of the new claim has not yet been determined. The Pollock is north of the Elm Orlu, which W. A. Clark is developing, and both are in the heart of the North Butte district. The Butte-Milwaukee Co. owns the Pollock and has options on several other properties adjoining that mine.

The Butte & Bacorn Copper Mining Co. has secured two additional and promising mining claims in the Allie Bell and St. Andrew, for which it has contracted to pay $29,000, having taken an option that will run to January 28, 1908. The two claims are owned by Maurice Isenberg, of New York, and James W. Murphy and Duncan McRea, of Butte, and adjoin the Colleen Bawn on the north and east. The Colleen Bawn is one of the principal properties of the Butte & Bacorn, and upon which it is sinking one of its three shafts. If the Butte & Bacorn strikes copper in the Colleen Bawn, as anticipated, the acquisition of the two additional claims will prove valuable, although the Butte & Bacorn already owns more than 300 acres of mineral ground in that locality. The Parrot Co. is equipping the Little Mina mine with new machinery with the intention of resuming work. This mine adjoins the Nipper. The famous Blue vein of the Nipper, over which there was so much litigation, strikes through the Little Mina, and it is expected that with sufficient development the property can be made a good copper producer. There is a shaft 800 ft. deep on the property, and it is the intention

the Parrot Co. to add at least 200 ft. to it, which depth, is believed, will take it into the orebodies.

The directors of the Boston & Montana Co. have made ppropriations for extensive improvements at Butte hereby the company will be able to increase its output copper by at least 20,000,000 lb. per year. Its present tput is 100,000,000 lb. The company is producing cop- r at a cost of 9 cents per pound, and the increasing out- t contemplated will give it an additional earning capac- y of approximately $2,200,000 per year. The capacity of e smelter at Great Falls will be increased about 1,000 ns per day; work on the improvements and changes that plant are now under way.

Houghton, Michigan.

eatly Increased Production From the Lake Superior Copper Mines. — Estimates of Future Output. — Important Statistical Data.

The great progress accomplished in the past decade, d now being carried forward at an increased pace, by e Lake Superior copper industry, is shown by the forces



Each rectangle is a township, six miles square.

Key to Mines.	Key to Mines.
1. Ætna	19. Tamarack
2. Empire	20. Osceola
3. Delaware	21. Tecumseh
4. Amygdaloid	22. Rhode Island
5. Copper Falls	23. Franklin, Jr
6. Central	24. Franklin
7. Phœnix	25. Arcadian
8. Cliff	26. Quincy
9. Mohawk	27. Isle Royale
10. Ahmeek	28. Atlantic
11. Allouez	29. Baltic
12. N. Kearsarge	30. Trimountain
13. Wolverine	31. Champion
14. Mayflower	32. Belt
15. Centennial	33. Adventure
16. Tamarack Jr	34. Mass
17. S. Kearsarge	35. Michigan
18. Calumet & Hecla	36. Victoria
	37. Winona

The Copper Region of Lake Superior.

ployed and by the capital invested in the business, as ell as by the steadily increasing output of copper. In 05 the production of refined copper by the Lake perior mines was 129,198,460 lb., and in 1905 the out- t was 229,270,035 lb., showing an increase of 77%. In 05 the forces employed in the copper mines of the Lake strict were 7,249 men, while at present the force is out 18,000 men, for the mines, mills, and smelters—an crease of 148%. It will be noted that the increase in rces is almost double the increase in production, the ason of which is not that the men are less efficient w than ten years ago, it is due rather to the vast ount of new work now under way.

Ten years ago the Lake Superior industry was at its west ebb. There were only seven mines in operation, d work was in progress along but twenty miles of the ineral range, in Houghton county, all work having en suspended in both Keweenaw and Ontonagon unties. Exploratory work was practically unknown ring 1894, 1895, and 1896, and the producing mines d practically no dead work, with the single exception the Calumet & Hecla, which continued its time- nored policy of opening ground for ten years ahead of mediate requirements. In 1897 there came a change r the better, with the beginning of exploratory work at x-Mile mill, south of Houghton, and from this new ginning have grown the Baltic, Trimountain, and hampion mines, which made more than 40,000,000 lb. copper last year, and will make nearly 50,000,000 lb. this year. In 1898 a considerable amount of new work was started, and there was a revival of the copper mining industry in both Keweenaw and Ontonagon counties, while 1899 was signalized by a mining boom of proportions unprecedented in the history of the district. Great as was the activity of 1898, there is more new work under way in 1906; but the work of the present day attracts far less attention and comment than seven years ago, due to the growth of the mining industry. In place of the 20 miles of copper belt on which seven mines were working ten years ago, there now are nearly 20 producing mines, and an equal number of developing properties, some of which are working on a large scale.

Although the Calumet & Hecla remains the leader, it is no longer the producer of more than half of the copper made by the Lake district, as was the case from 1870, only four years after the mine was opened, until and including 1901, with the single exception of 1892. For 1905 the Calumet & Hecla made but 41% of the copper turned out by Lake mines. In 1895 the Calumet & Hecla made 79,137,399 lb. fine copper out of a total production of 129,198,460 lb., leaving only 50,061,061 lb. from other mines, while in 1905 the Calumet & Hecla made 95,100,610 lb., an increase of 20% in 10 years, and other mines made 134,159,425 lb., an increase of 168 per cent.

The vast amount of exploratory and development work now under way, both at the old mines and at the properties not yet productive, will require years to arrive at full fruition. From five to seven years' time and the expenditure of one and a half to two million dollars are required to make a new mine in this district, and the production of 1905 may be said to mark the results of the work begun in 1898 and 1899. Predictions are hazardous, but in a general way it is possible to forecast the results six years hence. Long before that time the Calumet & Hecla should have a monthly productive capacity of ten million pounds of fine copper from the shafts of its main property, in addition to which the company should be getting an output, by that time, from several of its numerous subsidiary properties, of which three, the Manitou, Gratiot, and Superior, make a promising showing. From its main tract the Calumet & Hecla should make approximately 125,000,000 lb. in 1912. The Baltic, Trimountain, and Champion mines of the Copper Range Co. should yield at least 75,000,000 lb. in 1912, leaving out of account the Globe, which promises well. The Osceola should be capable of producing 25,000,000 lb. six years hence. The five mines enumerated in the forego-

ing list should make, by the figures given, 225,000,000 lb. copper in 1912, practically equivalent to the total output of the 18 producing mines of the district during 1905, leaving the output of 13 other producing mines of 1905, plus the output of new mines as a net gain for the output of the district. In all likelihood the 1912 production of the Lake Superior mines will reach 375,000,000 lb. of copper.

Leadville, Colorado.

Good Output Last Month.—Many New Developments and Discoveries. — Sugar Loaf District Reviving. — Important Find in Iowa Gulch.

Despite the fact that during the early part of the month the smelters were compelled to face a serious condition because of the scarcity of labor, and that a number of the mines took advantage of the situation to close down for needed repairs, the output of the district for September reached the sum of 89,230 tons, as compared with 88,600 tons for August.

The Penrose has completed the installation of its underground electric plant, which is being used to furnish light for the mine. A Pelton wheel, driven by water from the Bison workings, furnishes the power. A shaft is being sunk on the Holy Cross vein of the mine. The vein carries good ore and at present writing over 1,000 tons of ore is broken and ready for shipment and milling. ——The Ætna Mining Co. is sinking a shaft on its property on Carbonate hill. At a depth of 300 ft. the shaft is still in lime, but it is expected in the next 50 ft. to reach the parting quartzite, the horizon at which many of the adjoining properties produced their rich chloride ore.—— The Yak Tunnel lateral has reached the Louisville workings and completely drained the property. Development work will commence at once on the lower levels, where large bodies of iron-zinc sulphides were lately exposed. ——The installation of a plant of machinery on the Jennie June has been completed and the manager reports a good body of ore exposed in the workings ready for stoping.

A new company, called the Bonanza Mining Co., has entered the Alma district and secured approximately 50 acres of mineral ground. A force of men will be put to work developing the property as soon as arrangements are completed.——The New Era will install a new plant of machinery during the month.——For some time past a force of men has been employed by the R. A. M. Co., repairing the shaft and surface buildings. It is the intention of the management to put a force of men into the mine as soon as the surface improvements are completed. This property was formerly a large producer. ——The Country Boy, on Nigger hill, is proving a bonanza to the Lanyon Zinc Co., of Iola, Kansas. From this property during a single month 450 tons of zinc ore running above 40% zinc have been shipped, in addition to the milling ore. The company is pushing development work.

An important strike is reported on the Lord Byron property in Iowa gulch. At 30 ft. depth a good body of ore carrying 7% lead, 16 oz. silver, and 27% zinc has been encountered. This discovery will stimulate development work on many properties in this locality.—— Another district to come to the front is Sugar Loaf. At present 130 to 150 tons are being shipped daily and the old Dinero, which produced heavily in former years, is soon to be among the active properties, as the Dinero Consolidated Mining & Milling Co. has been organized to re-open the workings. This mine has two fissure veins which formerly produced quantities of high-grade ore. A superabundance of water stopped operations at the lower levels and forced the work to the upper workings, where low-grade ore was mined. An adit will be driven 3,000 ft. from the base of the mountain to a point below the Dinero shaft; this will not only remove the water but will furnish a means of easy transportation of the ore to the smelter. Among the improvements, an electric plant will be installed for light and power.

Morenci, Arizona.

Activity at the Silver Bell and Imperial Mines.—Important Development in the Humboldt Mine.—The Arizona Copper Co. makes Many Improvements.

Much activity is being shown at present at the Silver Bell mine. The big air-compressor will soon be ready for work, and the erection of the smelter will also be commenced. The Imperial Copper Co. is sinking its shaft to the 900-ft. level, and when the compressor is ready to operate air-drills, the shaft will be continued to the depth of 1,800 ft. It is estimated that the smelter will be completed in about six months, and besides treating the output of its own mines the Imperial Copper Co. will do custom smelting.

The Cleveland-Arizona mine, said to be under the control of the Standard Oil interests, having been flooded, the management is now installing machinery to get rid of the water. The main shaft is now down 600 ft., with 600 ft. of lateral work. A large number of other claims are also being worked here by this company. Sinking is being continued on the Arcade group of 16 claims, where there is a good showing. The Indiana-Arizona main shaft is down to 400 ft. and has uncovered high-grade copper ore. The Great Sulphide Copper Co. is sinking its shaft below the 300-ft. level and will prospect thoroughly with a diamond-drill. Development work is going steadily ahead on the Crepin-Richardson group, and the showing made is considered highly satisfactory. The main shaft of the Cole-Glidden mine is down over 200 ft. and good copper ore has been encountered. The La Mina Cobre Co., which is working twenty claims, is sinking a timbered, double-compartment shaft to a depth of 115 ft., where lateral exploration will commence. Two gold claims owned by Dick Lakenan in Gold gulch have been leased to Walter Doudna.

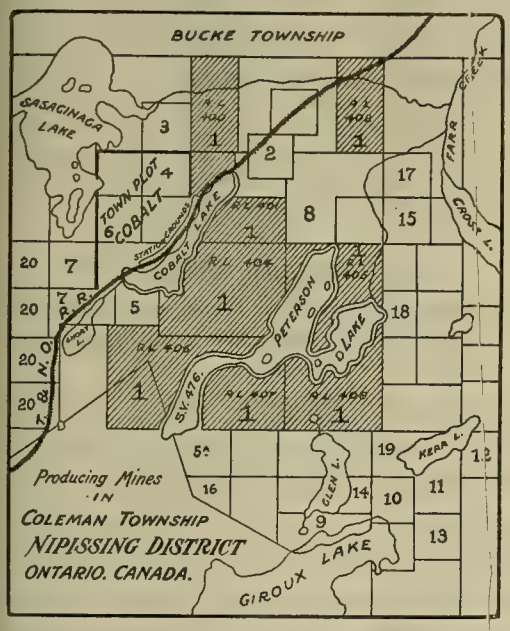
At the Humboldt mine, of the Arizona Copper Co., an important vein has been discovered 420 ft. from the shaft on the first level. Some ore had been taken from the vein previously, but it gave out after driving a short distance. A drift going north was begun lately and the face of it was advanced 135 ft. from the main level. The vein was small for the first 100 ft., but then began to improve. On the 60-ft. level in No. 12 drift, a good vein of ore was found between stopes No. 12 and 13, and a raise put up from the adit-level to connect. On the third level of the King group, beneath stope No. 3, an incline winze has been sunk 70 ft. in good oxidized ore, finally meeting sulphide ore, which assays 14% and is eight feet wide. On the fourth level the old King vein has been exposed 450 ft. below the first level; this constitutes the most important development in this ground for the past six months. Where it was cut the vein was of sulphide ore, 18½ ft. thick, and assaying 5.1%. It has been followed for 150 ft., and so far it maintains its value. By this exposure a very large body of sulphide ore has been placed in sight between this and the upper level, a distance of 237 ft. Raising for air and further driving are in progress. At the claims of the Arizona Copper Co. above Metcalf many surface improvements have been in progress during the past six months so as to allow of handling a larger tonnage. A 125-h.p. boiler has been erected preparatory to replacing the gasoline hoist by a double-drum steam-hoist. To supply water to the mine and camp, a well was sunk in Chase creek, half a mile north of Metcalf. Here a suction and a force pump have been installed, and

water is elevated through a 2-in. pipe-line 2¼ miles long to tanks of 60,000-gal. capacity situated above the mines. The tramway to the head of the incline is being improved to allow a light locomotive to replace the present horse-haulage. The installation of the steam hoist, steam haulage and other improvements will result in a much larger output for this group.

Toronto, Canada.

Cobalt is Booming.—The Foster-Cobalt Deal.—Wonderful Showing of Silver in the Nipissing.—Encouraging Development in La Rose Mine.—Other Finds in the District.—Doubt Thrown on Peace River Discoveries.

Cobalt is booming as it has never boomed before as a field for extensive investments. The sale of a controlling interest in the Foster-Cobalt mine to a syndicate composed partly of American and partly of Canadian capitalists is regarded merely as a prelude to the consummation of many similar deals now in contemplation, by which paying propositions which have only been worked in a small way will be acquired by men with ample capital to introduce modern machinery and exploit them thoroughly. The past week has been characterized by the visits of many capitalists to the camp and important developments in the transfer of properties to be largely capitalized and put on the market are daily looked for. The success of the Nipissing flotation combined with the practical results which have followed the application of improved mining and prospecting methods, marks the inauguration of a new era of production on a large scale and the gradual disappearance of the small operator.



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Trethewey Silver-Cobalt Co.
4. Contagas Mining Co.
5 & 5 A. McKinley-Darragh-Savage.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay Co.

It is understood that Toronto and Montreal capital is largely represented in the Foster-Cobalt syndicate, and that the president of the reorganized company will be W. K. George, of Toronto. A new manager, A. W. Scott, a former Nevada miner, has taken charge and introduced many changes. The staff of 40 men employed will be largely increased and compressor-plant and steam-hoists installed. Yesterday 35 tons of ore, valued at from $60,000 to $70,000, were shipped from the mine. F. C. Loring, the mining engineer in charge, says that ore of the value of $700,000 is already blocked out. The exact details of the deal under which the syndicate secured control are not known, but it is understood that 600,000 shares were bought at about $1.50 per share, the par value being $1.

At the Nipissing, the now famous vein known as Ledge 49, is being opened up under the superintendence of Capt. John R. De Lamar and Ambrose Monell, two of the directors. Large crowds have been attracted by the great nugget extracted from this vein, weighing over two tons, the silver content of which is estimated at $19,000. The vein has now been uncovered for about 260 ft. For 150 ft. of this distance, according to Prof. W. E. Hidden, it has a width of about 60 in., then narrowing down to from 14 to 28 in. The contents of the widest portion of the vein are largely cobalt and other inferior ores, but as the vein narrows it increases in richness, the silver content being about 50%. The persistence of this vein in width and richness for a depth of 50 ft. below the surface would indicate a value of about $4,000,000. As other veins in the neighborhood have been worked to that depth, and in some cases below it, without showing any falling off, this is regarded as a safe estimate. Prof. Hidden states that the company will erect a building 150 ft. long, covering the most valuable portion of the vein, under which the work will be carried on. In some spots the vein will have to be chiseled out, owing to its richness in pure silver. A large central compressor-plant will shortly be installed for the supply of power to the various workings, and a central shaft is being sunk at Ledge 49, which will be continued to a depth of 500 ft. At Ledge 26, the output of silver from which has been over $300,000 to date, a shaft is being sunk and operations will be continued all winter. At the 70-ft. level of this shaft, drifts will be run into the three veins which converge near this point. The hydraulic plant used for the work of stripping and disclosing new veins has proved the economy of the process and fully justified the experiment, some half dozen veins having been discovered by this means. Ore shipments from the Nipissing mines to date have aggregated about $1,400,000.

An important feature in the development of La Rose mine is the recovery of one of the veins which at a depth of 225 ft. went into the walls and disappeared altogether at 300 ft. Cross-cutting, however, showed that the vein was still there. The fact is regarded as auspicious for the future of the camp. Three carloads of ore were shipped from La Rose last week.——The Buffalo mine has three carloads of ore ready for shipment, one carload being high grade.

Among new discoveries reported and awaiting official inspection are a find of gold-bearing quartz by Gordon Benson about two miles southwest of Cobalt town, and a silver-cobalt vein 18 in. wide just north of the Red Rock property in Bucke township.——The Right of Way Co., which recently acquired the mining privileges on the right of way of the Temiskaming & Northern Ontario Railway, held a meeting for the organization at Ottawa recently, T. A. Beament being elected president, E. Seybold, vice-president, and E. A. Larmonth, secretary and treasurer. Work has just been commenced on the property.

The Dominion Geological Survey officials are disposed to doubt the value of the reported discoveries of gold by J. A. Macdonell, in the Peace River district of Alberta. They state that last winter some of the samples were examined by them and found to be iron pyrite. Mr. Macdonell is positive that the gold is there, stating that

he tested it with quicksilver. Thorough tests will be made here and at Montreal.

A new mining division has been created comprising the territorial districts of Parry Sound and Muskoka, to be known as the Parry Sound mining division. Henry F. McGuire is appointed recorder.——Charles W. Belyea has been appointed recorder of the Kenora mining division.——The Canada Corundum Co., Ltd., has been authorized to increase its capital stock from $1,500,000 to $2,500,000.

Another big strike has been made at the Laurentian gold mine, in the Manitou Lake area. The raise from the first level is 50 ft. up, with rich ore all the way. While driving operations were in progress to connect the top of the raise with the main shaft, unexpected resistance was met with from massive gold which the machine-drills were unable to penetrate. Blasting was resorted to, one shot bringing down $15,000 worth of gold. The ore at this point is three-fourths native gold.

Cripple Creek, Colorado.

Output to Increase Shortly.—Rich Strike in Lucky Gus.—New Machinery for the Jerry Johnson.—Treatment Charges.—South Dante in Big Ore.—Portland Cyanide Plant Nearing Completion.—Heavy Output From the Granite.

The output of the camp for the month of September was considerably less than that of previous months, which was due, to a great extent, to several mines storing a part of their production to be shipped at a later date to mills (outside of the trust) now in course of erection. The September tonnage of the district treated by the United States Reduction & Refining Co. fell off about 5,000 tons. When the Golden Cycle mill at Colorado City is completed, which at the present time does not seem probable until the early part of December, the tonnage of the district will increase quite materially. The enlargement of this mill to accommodate an increased capacity of 400 tons is already discussed by the management.——A rich strike of ore at a depth of 300 ft. has been made during the last few days on the Lucky Gus of the Stratton Estate, situated on the southwest slope of Bull hill. A carload from this new find, which is being broken three feet wide, went out the first of this month and is expected to run $75 per ton.——Another 100-ft. lift is to be sunk on the Gold Sovereign shaft on Bull hill to enable the large orebody recently discovered on the 800-ft. level to be economically worked. The ore from this mine will be shipped direct to the Golden Cycle mill at Colorado City in the near future.

New machinery, to replace that destroyed by fire on the Jerry Johnson mine recently, has been ordered and will shortly be on the ground. The 600-ft. shaft will be sunk to facilitate thorough development of the property. —— A circular letter has been sent out by the Findley Gold Mining Co., stating that shipments will be discontinued to the plants of the smelter trust owing to the excessive rates of freight and treatment. No ore will be shipped until the Golden Cycle mill is ready to receive it. The difference between the open rate of the smelters and the rate at this mill is approximately $3 per ton, which on an output of 200 tons or more per month makes a big difference in the profit. The Golden Cycle Co. is now in the market for ore to be treated in their mill at Colorado City. —— Two leases have already been granted on the United Gold Mines property. Frank Edwards, of Independence, has obtained a lease on the Trail claim below the tunnel level. The term of the lease is for one year and the royalties are graded from 15 to 30%. Fifty shifts of work per month are required by the lessor company. The northern part of the W. P. H. claim, situated on Ironclad hill, has been leased to Morris Eads, of Victor. —— The lease of the British American Mining Co., Ltd., on the South Dante, has become one of the most promising in the district. Operations are being carried on at a distance of 3,000 ft. from the mouth of the Trail tunnel in Eclipse gulch. This long tram greatly retards the output, but the adit is now being straightened and put into shape to handle the increased tonnage. Ore is being stoped from a junction of veins, everything being shipped just as it is broken. Assays taken across the orebody, which is between 20 and 30 ft. wide, run from $15 to $300 per ton, and rusty gold can be seen in many places.

The Portland Gold Mining Co. has declared its regular quarterly dividend of five cents per share, amounting to $150,000. The cyanide plant being built by this company at Colorado City is nearing completion and will treat the immense tailing dump from the mill. The output for the month of September from the Granite mine on Battle mountain was approximately 2,250 tons on company account and 600 tons by lessees operating on the Monument, Gold Coin, and Upper Granite claims. The grade of the ore averaged an ounce and a half per ton. This heavy production makes the Granite property one of the foremost in the district.——Owing to the recent snowstorm, which has made the roads heavy, the Little Clara mine has not been able to ship its ore fast enough to keep the ore-house clear. Marsh, Hodges & Co., leasing on this mine, are very anxious to force the production, as their lease expires in a year and they do not care to take any chances in case of renewal being refused.

Salt Lake, Utah.

Local Business.—Activity in Beaver County.—Gold Springs Camp.—Daly-West Makes a Strike.—News From Tintic.—Increase of Gold in the Ohio at Bingham.

The ore and bullion settlements of the past week amounted to $705,000 and the sales of the Salt Lake Stock & Mining Exchange during the same period aggregated 317,043 shares, for which $178,844 was paid.

Beaver county is the scene of increased activity and important developments have been reported from a number of mines there. In the Cactus, operated by the Newhouse Mines & Smelters corporation, a large orebody, heretofore unexplored, has been opened on the lower levels. It has been cross-cut on the 600 level showing a width of 68 ft., the mass being mill-stuff mixed with a great deal of high-grade shipping ore. The new find has caused a marked advance in the price of the stock.—— The Cedar Mining Co., operating near Milford, in a cross-cut from the 125-ft. level of an incline-shaft has cut a body of high-grade silver-lead ore. The company is preparing to make shipments. Herman Barnett, of Salt Lake, is manager.——The Revenue Mining Co., of which L. G. Burton of Salt Lake is consulting engineer, has been carrying forward a vigorous campaign of development for several years and has acquired patents to about 2,000 acres. A large tonnage of ore has been developed and a new stamp-mill, which is to treat from 25 to 50 tons of ore daily, is nearing completion.—— Unusual activity is being displayed all over the western part of Beaver county and good results are being obtained almost everywhere.——In Iron county, too, mining is picking up. The new camp of Gold Springs is rapidly coming to the front. A representative of the Davis-Daly Estates has acquired short-time options on a number of properties there, among them being the Donohue group. The Jennie Gold Mining Co. is developing ore rapidly and will soon begin shipping. The General Engineering Co. of Salt Lake is making some tests of the ore and

drawing plans for the proposed mill, which will start with an initial unit of about 30 tons of ore per day. The Jennie shaft is situated about 15 ft. from the Utah-Nevada State line and the company owns ground in both Utah and Nevada. Charles A. Short, of Gold Springs, is manager of this company.

The Little Bell contact vein, which the management of the Daly-West Mining Co. has been driving for during the past few months, has been encountered and is considered to be the most important development in that mine in a number of years. A drift 40 ft. long on the vein has been run in four feet of high-grade ore. The Western Utah Copper Co. has filed articles of incorporation in Nevada to operate the Gold Hill mine in the Clifton section of the Deep Creek mining district. The company is controlled by parties heavily interested in the Bingham Con. M. & S. Co., and is capitalized for 500,000 shares of $5 each. The officers and incorporators are: W. S. McCornick, president; Duncan McVichie, vice-president; H. H. Green, secretary and treasurer, who, with E. L. White, F. Augustus Heinze, Henry N. Sweet and John A. Street are directors. Some extensive bodies of copper ore have been developed. The mine is situated 30 miles from the main track of the Western Pacific railroad and will be reached by a branch line. The management of the Eagle & Blue Bell mine in the Tintic district reports the strike of a large body of good ore at a point 400 ft. north of the shaft on the 1,000-ft. level.——The Annandale property in the Tintic district, optioned to F. Augustus Heinze, several months ago, is being developed. The ground adjoins the Centennial Eureka mine, which is under the control of the United States Smelting, Refining & Mining Co.—— The management of the Lower Mammoth Mining Co., in the same district, has ceased work on the 1,700 level pending the sinking of the main shaft from the 1,500-ft. level.



Utah.

The Ohio Copper Co., at Bingham, while development and extraction goes on steadily in other portions of the mine. The shipments of concentrate during the past week has revealed the presence of larger gold values than heretofore obtained in this property, control assays showing as much as $3.20, as against 70 and 80 cents in former shipments, while the copper ran about 24%. The Ohio looks now as if it would make one of the big shipping mines of Bingham.

Mining Summary.

ALASKA.

Gold to the value of $50,000 has already been brought from the new placer diggings in the Yentna district, lying south of Mount McKinley in Alaska. The pay has all been extracted from stream diggings, the benches having received but little attention. The locality will probably be thoroughly prospected in the immediate future, as it is comparatively easy of access from Seward.

ARIZONA.

COCHISE COUNTY.

At Johnson Camp, Brown & Wien have taken a bond and lease on four claims belonging to Ben. X. Williams. The bond is for one year at $25,000, and the lease calls for a 10% royalty. They have some good copper ore in sight.—— Elex. Bannow is doing assessment work on his group of copper claims. —— W. A. Johnston has let a contract for development work to be performed on his group of four claims. —— Machine-drills have arrived and are to be installed in the shaft of the Arizona & Michigan Co.—— Supt. Mackay, of the Black Prince Co., is preparing to install machine-drills. —— There are three sets of lessees operating on the Mayflower copper claim, and all are getting good results. —— The Republic continues to make regular shipments of ore. —— The Peabody holds her record as a good producer, shipping about three cars per week. —— The People's Party group is being worked by the new owners and bids fair to rival the Peabody. —— The Cochise Copper Co. has its shaft down 230 ft. into the wash; three shifts are at work. George M. Brown, the superintendent, expects to encounter the lode at about 250 ft. —— This camp has produced within the last six years approximately one million dollars worth of copper, one-half of which is profit. While the Peabody has furnished about half of this amount, the Republic, Mammoth, Copper Chief, People's Party, and other groups, have contributed also. Although several of these mines have been worked for more than 25 years, comparatively little development work has really been done. It is only within the last year that capital has become favorably impressed with the district, and while there is much activity, there is still a wide field of undeveloped prospects which offer fair inducements to speculators. There being little or no positive ore blocked out, the properties cannot as yet be offered as investments.

YAVAPAI COUNTY.

(Special Correspondence).—Among a number of mining properties upon which development work has been recently inaugurated in Yavapai county, and which give promise of doing well, is the Fuller group of mines in the Squaw Creek district, recently purchased by the White Horse Mining Co. Despite the distance of the mines and district from railroad communication, these mines have from time to time produced a large amount of high-grade ore, work being later discontinued when the water-level was reached, and the ore gave indications of changing to sulphide. The new concern which lately acquired the property is under the management of the Manhattan Securities Co., of New York, with T. E. Campbell as general manager, who is conducting the operations in a miner-like way with a view to getting the property in shape for economic work. The underground operations are at present confined to running No. 2 adit to connect with No. 2 shaft, a distance of 200 ft. farther west along the vein. The shaft is now 127 ft. deep, and the adit will tap the vein at a depth of 188 ft. below the bottom of it. From this shaft some of the best ore ever found in the mine was taken in 1898 by Colorado miners, who had a lease on the ground. The pay-streak in the adit is now five feet wide, and samples on the average $12 per ton in gold. In addition to this, and associated with the pay-streak, a four-inch vein of sulphide ore was recently uncovered, which gave returns of $130 per ton in gold, and which appears to be widening out as the adit is being advanced. Since this sulphide ore was struck there has been an increase of water, but not enough to interfere with the work. The water can be used to great advantage later,

when work on the mine is far enough advanced to commence the treatment of the ore in the mill. This is the first water of any consequence ever struck in the mine, and coming, as it does, with the appearance of the sulphide ore, is a good indication that the sulphide streak is a permanent one.

Phœnix, October 5.

CALIFORNIA.

CALAVERAS COUNTY.

The Mokelumne Hill mining district is the scene of much activity. The 20-stamp mill at the Hamby mine is nearing completion, while in the eastern part of the district, the Easy Bird mine is increasing the capacity of its reduction plant, a large rock-breaker and another concentrator being added. North of the Easy Bird is the Lucas mine, which is being equipped with a compressor and three power-drills. ——The North Star mine is going to be systematically worked and the main tunnel re-timbered.——A new shaft is to be sunk on the Blue Jay mine. Over 50 men are now employed in the Mokelumne Hill district.

NEVADA COUNTY.

E. B. Whitehead has been developing a valuable claim at Deadman's Flat. Five well-defined veins have been discovered varying from eight inches to four feet wide and assaying $10 to $30. The ore is free-milling and of the 'blue ribbon' variety, which has proved so productive in Grass Valley.

SIERRA COUNTY.

(Special Correspondence).—The rock-house at the Sierra Buttes mine burned on the 7th inst., and will cause the tramway to close down for a short while.——The Hayes Con. Co. is rushing the building of the 20-stamp mill and will soon have it ready.——The Sovereign Co. is sinking a shaft on the Nevada claim; it is in sulphide ore, principally iron pyrite and galena, averaging $40 per ton.——The Empire Co., in Gold Valley, is re-building the 25-stamp mill and adding a cyanide plant to treat the tailing.——J. W. Buckingham has completed his five-stamp mill and began crushing last week.——The Tightner mine has increased its force and will complete the adit as soon as possible, which will be 1,400 ft. long. H. L. Johnson is superintendent.—— Tom Winrod, Ed. Deal, and H. W. Turner, owners of the Antler mine, have completed the adit and struck the vein 200 ft. in depth, which is 10 ft. wide and pans $4 per ton in free gold. This is a promising prospect that bids fair to become a good mine.——F. P. Roddy, superintendent of the Poker Flat mine, has returned from San Francisco and is repairing the mill.——Hood & Kelleher, who have been mining on Bunker Hill for a great many years, have struck the gravel channel on the rim and it prospects well in coarse gold.——Poore & Johnson, at Deadwood, have struck gravel that pays one ounce to the set of timbers.——The Telegraph Co. has been troubled with water. It is increasing its pumping capacity and will resume sinking soon.——The South Fork Gravel mine is working with two shifts in the adit and is in the same character of bedrock as on Bald mountain. They expect soon to strike the channel.—— R. D. Williams has struck a two-foot vein in the Eagle Bird mine at a depth of 200 ft.; this is a fissure vein in the granite near the head of Jim Crow canyon.

Downieville, October 8.

SISKIYOU COUNTY.

The Lanky Bob mine at Salmon river has a force of men at work, and the mill is running constantly on quartz which averages $25 per ton. This is the mine about which considerable litigation has been in progress, with a case still on trial by appeal to the Supreme Court.——The California Associated Mining Co., which purchased the old Gold Ball or Yreka Mining & Milling Co. claim, has twelve men employed in development work to open the claims for extensive operations. The first payment on the claim was made some time ago, and the balance is expected as it becomes due under terms of the bond.

C. A. Patterson is shipping a ton sample from the Spencer claim on Humbug creek.——The Advance mill and the Highland mine in the Salmon River district are now running continuously in spite of the scarcity of water.——The Yreka dredger has been shut down indefinitely.

TUOLUMNE COUNTY.

Development work done at the mine on the Kline ranch, near Stent, since the recent strike, shows improvement in the ore as depth increases. The owners are getting from $1 to $10 per pan from the fine quartz after blasting.——The 10-stamp mill of the Imperial mine, near Jacksonville, is being put in readiness for operation.——Rich ore has been uncovered in the Blackhawk mine, situated west of Soulsbyville and operated by A. A. Irish, of Los Angeles. It is reported here this week that the ore will run into the hundreds of dollars per ton. The vein is three feet wide where the discovery was made.——It is rumored that negotiations are under way for the purchase of the Confidence mine.—— Within a few days the 5-stamp mill of the Mary mine, the property of the Mountain Mining Co., will be started up. ——Development work at the Uncle Sam mine, near Arastraville, is being done on a shoot of ore rich in free gold, recently uncovered.——The shaft of the Longfellow mine, at Big Oak Flat, is being sunk to a depth of 700 ft. Until new orebodies are opened up, the mill will run daytime only. Underground work is being prosecuted with three eight-hour shifts.——The force at the Providence mine numbers 25 men and is being increased.——It is reported that the Del Monte will soon be in operation again.——The Lady Washington mine and millsite and the California and Golden West mines, situated near Tuolumne, were conveyed by deed on the 4th inst. to W. C. Elkins, of Cleveland, by E. P. Heald, of San Francisco.

The Golden Rock ditch, which will supply water to the mines about Groveland and Big Rock Flat, is nearly finished, and the citizens of the 'south of the river' are making preparations to celebrate. —— The Big Creek Gold Mining Co. has manufactured enough lumber for its proposed long flume and its sawmill has been closed down. —— At the App mine, 100 men are employed. The machine and blacksmith shops and other buildings recently destroyed by fire are being re-built. A 25-drill compressor has been installed.—— The Tuolumne Water Co. expects to keep nearly 200 men employed throughout the winter on the big dam being constructed and on other improvements. Next year there will doubtless be an ample supply of water for all the mines desiring it.——At the property of the Standard Gold Mining Co. the adit last week reached the Hardtack vein on the footwall. Considerable work has been done to accomplish this, but the discovery made is said to be regarded as ample compensation for the outlay of money and time. The ore is rich and the strike is considered valuable. T. F. McAvoy, the superintendent, has 12 men employed at this mine.—— The force at the Don Pedro mine is being increased.

Tuolumne, October 8.

COLORADO.

PARK COUNTY.

(Special Correspondence).—The Snowstorm Hydraulic Co. of this place has closed down for the season. The manager, W. E. Thorne, reports a very satisfactory clean-up. During the early part of the year most of the work which was done on the placer was development work, but the latter part of the season, especially the last two months, has shown a nice profit to the company. The early snow would indicate that the coming year there will be plenty of water for hydraulic purposes. The Snowstorm intends driving a long tunnel through the banks of Beaver creek. During the last season Mr. Thorne has had drills at work prospecting the Beaver creek placers and the results of the drill-holes justify a large scheme of operations. The work will probably be carried on through the winter months, so that when spring opens up the company will be ready to proceed with hydraulicking.

Alma, October 5.

GUNNISON COUNTY.

(Special Correspondence).—J. M. McDougal, manager of the Denver City mine, 12 miles southeast of Gunnison, recently cut 6 to 8 ft. copper and zinc ore at a depth of 112 ft. The ore runs 36% zinc and 10% copper. Mr. McDougal has about 200 tons of ore in the bins and has completed 600 ft. of drifts and cross-cuts. The ore also carries $4 in gold and silver.

Gunnison, October 2.

The Carter tunnel, of the Ashland Mining Co., is 2,400 ft. length, and is opening up ore; later on, when development work has progressed far enough, the company will uild a mill for handling this ore. At present a drift is ing pushed ahead on an 18-ft. vein near the breast of the lit. There are five other veins on which milling ore has en opened up. This company owns the ground ahead of for over one mile and after this territory has been pierced, e adit will be extended and used to transport the output mines to the east of it. The property is equipped with a eyner compressor and power-drills. Carrol M. Carter is esident and general manager.——The Grand Prize adjoins e Ashland on the east, and is shipping five 20-ton cars per onth that will average $100 per ton. W. C. Black, of lida, is the manager.——About one mile north of the rter tunnel is the Raymond Consolidated Mines Co. uring the past year a new mill has been built. The adit now 2,200 ft. in length and there is about 1,000 ft. of drifts the first vein, 500 ft. on the second and 400 ft. on the ird vein. In the upper works, there is a tunnel 900 ft. ng with a 200-ft. winze. These upper workings are conected with the mill by an aerial tramway, which handles ght tons of ore per hour. On the last vein cut in the main dit a raise is being made to connect with the upper workgs, so that all the ore from the surface can be brought wn through the lower adit instead of over the aerial tramay. The main adit is 9 by 9 ft. in the clear and it is the tention of Eugene M. Lamont, the manager, to lay a uble track and either use compressed air or electric haule. The power plant consists of two 100-h.p. Union Iron orks boilers; one 20 by 20 in. Norwalk compressor; one -h.p. Climax engine; one 150-h.p. Skinner engine, which erates the mill by means of a rope drive; two 250-volt nerators. The ore first goes through a 10 by 16 in. Blake usher and is then elevated 25 ft. by a belt-conveyer and scharged into the battery-bins and fed through four autoatic Challenge feeders to the stamps. The mill contains ur batteries of 1,000 lb. stamps making 105 drops per min. then passes over amalgamating plates and thence to four ilfley and four Card concentrators. The tables discharge to shaking launders which feed automatically to a dryer. he mill work is done by four men on two 12-hour shifts, d produces about 500 oz. in gold bullion per month and 0 tons of concentrate. The slime is handled by the oberts slime table, which is said to be a satisfactory mache. The dryer is of the hoe conveyer type and reduces the oisture in the concentrate to 1%. The concentrate as cked for shipment will average $30 per ton. This mine is tuated about five miles from the Gunnison division of the olorado & Southern railway, from which point all supplies r the mines and mill are brought by wagon. This mill as furnished and constructed by the Colorado Iron Works o.——The Goldsmith Leasing Co. has recently secured a ase on the old Goldsmith mine and is preparing to put in stamp-mill which was purchased some time ago from the orse Bros. Machinery & Supply Co. They claim to have good streak of smelting ore which runs from $80 to $100 r ton. The mill-dirt runs $17 to $20 per ton. E. C. tatler is manager.——The Gold Link Co., of which A. E. eynolds, of Denver, is the principal owner, has started exavating for a mill.

Ohio City, October 4.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The shaft of the Wyoming-earchlight is down 209 ft. From the experience of adjoing properties only about 40 ft. more work will be necessary reach water-level.——Harry Adsit, manager of the olorado-Nevada property and formerly manager of the omboy mine in Colorado, reports 185 ft. of work in his ouble-compartment shaft. All the work done on this roperty is of a substantial kind, showing the confidence of he owners.——On the Blossom, from which $317,000 was xtracted during development, work will shortly be reumed. The Pompeii also will resume; in the meantime it affording Searchlight with a supply of excellent water, he capacity being 160,000 gal. per day.——Forty-seven men re at work on the Searchlight M. & M. Co. A cyanide plant capable of handling 100 tons per day is almost completed: 20 vats have been installed. Two 70-h.p. boilers are being put in, the work to be entirely completed within ten days. They have 3,000 tons of tailing already accumulated, which will run over $5 per ton. The cost of handling the tailing through the new plant is estimated at $1.19, making a clear profit of over $4 per ton. The shaft on this property is down 350 ft. Several new cabins are being erected for the accommodation of the increased force of men.——A. A. McKnight, of the Mines & Securities Co., Denver, has a bond on the Stoner property in El Dorado canyon. They have outfitted at Searchlight, preparatory to working a large force of men. F. Wallace White, of Pittsburg, has been visiting the Wallace group in El Dorado canyon, with the intention of acquiring property for his syndicate.——The Quartette Mining Co. is making improvements on its miners' cottages. Superintendent Harrington, who recently suffered from a stroke of apoplexy, is reported better.——The electric machinery has finally arrived and the entire Searchlight lighting system will be working within a week.——G. F. Colton, one of the owners in the Duplex, which was recently sold to John Brockman and Count Portales, is here. Mr. Colton is the man who named the town of Searchlight

Searchlight, October 6.

NYE COUNTY.

(Special Correspondence).—Charles E. Knox (president of the Montana Tonopah), Harry Ramsey, James L. Butler, and Frank M. Ish, of Tonopah, have purchased the old Congress mine and will soon resume operations. J. J. Fairchild, formerly of the Johnnie Con. Gold Mining Co., has been selected as superintendent. This property has a shaft 350 ft. deep, all in ore. The orebody on the 700 level of the Johnnie Con. mine has been defined as 5½ ft. wide, assaying between $25 and $30. Sixteen men are now working underground in this property.——Two shifts are working on the Frost-Rathborne lease on the Johnnie Con. ground sacking ore on the 40-ft. level.——The Bullfrog-Johnnie Co. has put a crew of men at work sinking a shaft on the Anna M. claim to determine the strength of the Blue Bell vein, the outcrop of which indicates that it extends into this ground.——Work has been started on the Clanahan mines by W. S. Smith in the Mineral Flat country. The property has a galena vein and assays from $100 to $150 in gold and 20 oz. silver.——L. L. Patrick, manager of the Florence mine and a magnate of Goldfield, has purchased a group of mines on Mineral Flat.——The Leadville-Johnnie has a force at work prospecting the Last Chance claim, which has recently shown some rich stuff. This is in addition to the regular work on No. 2 shaft.——In the Globe, work is still confined to the lower tunnel. The new shaft is being sunk on an extension of the Johnnie lode, which shows 5½ ft. of ore assaying from $10 to $15.——The Frost-Rathborne lease on the Johnnie Con. ground is sacking rich ore from the surface. They evidently have an extension of the Globe Treasure vein.

Johnnie, October 3.

WHITE PINE COUNTY.

The Nevada Consolidated Co., which is doing so much toward the development of the Ely copper district, is involved in an action in the District Court relating to the title of six important copper claims known as the Chainman group. This property, located in the centre of the productive area, is valued at $500,000.

BRITISH COLUMBIA.

A serious situation is developing in the Boundary district as a result of the strike in the Crows Nest coal mines at Fernie, B. C. The shortage of coal is becoming a serious menace both to the smelters and also to the mines dependent on them. The Granby reduction works alone consume 300 tons per day and the stocks are exceedingly small. Efforts are being made to meet the demand from Washington and Vancouver Island, but it is probable that the smelters will be partially, if not wholly, closed down unless some compromise is immediately arranged between the miners and operators at Crows Nest. A great number of mines would be effected if ore could not be accepted by the custom smelters.

Personal.

J. PARKE CHANNING is in Colorado.

CURTIS H. LINDLEY is at Ely, Nevada.

R. GILMAN BROWN is in Chihuahua, Mexico.

WILLIAM BLACKMORE is examining mines in Norway.

T. R. HENAHEN has returned to Silverton from Missouri.

J. P. SIDWELL has returned to Chicago from Ouray, Colorado.

H. DEC. RICHARDS is at Orleans, Siskiyou county, California.

J. B. JENSEN, of Salt Lake City, is in the Greenwater district, California.

C. M. FULLER has returned to Denver from a professional trip to Kentucky.

ARTHUR LAKES has been examining mines in Gunnison county, Colorado.

W. L. AUSTIN will be at San Francisco on October 16, on his way from Butte.

CHARLES BUTTERS has returned from Europe. He goes to Salvador next week.

M. T. CHESTNUT and son, of St. Louis, Mo., are now living at Durango, Colorado.

E. M. RAY, of Los Angeles, Cal., is engaged in professional work in Idaho and Montana.

H. B. WARREN has been appointed manager of the Northern Mines Ltd. at Atlin, British Columbia.

HOMER WILSON is now superintendent for the Centennial-Goldfield Mining Co. at Lida, Nevada.

R. R. LESLIE has resigned as superintendent for the Creston-Colorado Mining Co., in Sonora, Mexico.

W. E. THORNE has closed down the Snow Storm hydraulic mine at Alma, Colo., for the season and returned to Denver.

J. D. BEEBE has returned from Alabama and accepted a position with the Lenawee Tunnel Co., at Montezuma, Colorado.

W. H. HOLMES has returned to Denver from Silver City, New Mexico, where he has been to report on mining properties.

THEODORE J. HOOVER has been appointed technical manager for the Minerals Separation Ltd., with an office at 62 London Wall, E. C. London.

R. L. LLOYD has accepted an appointment as metallurgist to the Braden Copper Co., in Chile. He sailed from New York for Valparaiso on October 6.

T. A. RICKARD has been appointed delegate at large to the American Mining Congress by President Roosevelt. He will attend the Congress, which meets at Denver on October 16.

JOHN M. DAUGHERTY, of Omaha, JAMES W. NEILL, of Butte, Mont., and THOMAS A. VARDEN, of Sacramento, have been looking over the properties of the American Mining & Development Co., at Kennett, Shasta county, and San Juan, Nevada county, during the past week. Mr. Varden is general superintendent for the company, and Mr. Neill is consulting engineer.

Obituary.

JOHN C. HENAHEN died at St. Joseph's Hospital, Denver, Colo., on September 21. The deceased was well known as a mining and smelter man throughout Colorado. He was at one time with the Grant and Arkansas Valley plants at Leadville, and later with the American Smelting & Refining Co. He was forty-six years of age at the time of his death. He is survived by his brother, Thomas R. Henahen, of Silverton.

WM. H. RUSSELL, an old-time California and Nevada miner, died at Chilpancingo, in Guerrero, Mexico, on September 30. 'Bill' Russell — as he was generally known — came to Mexico in December, 1903, and had charge of some part of the Guerrero Development Co.'s work up to within a few days of his death. He intended to return to California this month, but was taken ill suddenly.

Publications Received.

From the UNITED STATES GEOLOGICAL SURVEY: Water Supply Paper No. 162, Destructive Floods in the United States in 1905.

From the UNITED STATES GEOLOGICAL SURVEY: 'The Production of Mica,' being advance sheets of the Mineral Resources for 1905.

Bulletin No. 8 Fourth Series, STATE GEOLOGICAL SURVEY OF OHIO on the Salt Deposits and Salt Industry of Ohio by John Adams Bownocker.

TOPOGRAPHIC AND CLAIM MAP OF MANHATTAN Mining district, Nye county, Nevada. By Dehy, Cromwell & McLaughlin. Scale, one inch to 800 feet.

CLAIM-MAP OF SEARCHLIGHT MINING DISTRICT, Nevada, by M. L. Cook. This is a useful map to those having interests in Searchlight district or contemplating a visit to that camp.

BULLETINS NO. 17 AND 18, Vol. 4 of the Department of Geology of the University of California, 'Notes on the Foothill Copper Belt of the Sierra Nevada' and 'An Alteration of Coast Range Serpentine,' both the careful work of A. Knopf.

A CATECHISM ON PRODUCER GAS, by Samuel S. Wyer, published by the McGraw Publishing Co. of New York City, is a little volume of information on the subject of producer gas given in a concise manner, and in a form calculated to make it enduring. Sent by the MINING AND SCIENTIFIC PRESS upon receipt of the price $1 net.

Bulletins No. 17 and 18, Vol. 4, of the Department of Geology of the University of California, NOTES ON THE FOOTHILL COPPER BELT of the Sierra Nevada, and An Alteration of Coast Range Serpentine, both represent the careful work of A. Knopf. Also Bulletin No. 15, Vol. 4, Contributions to the Classification of the Amphiboles and Notes on Some Glaucophane Schists, Syenites, etc., by G. Murgoci.

Books Received.

The GEOLOGICAL MAP OF ILLINOIS by Stuart Weller, and the Petroleum Industry of Southeastern Illinois by W. S. Blatchley comprise Bulletin No. 1 and 2 of the Illinois State Geological Survey at Urbana, Illinois.

The LIMESTONE RESOURCES and the Lime Industry in Ohio by Edward Orton, Jr., and S. V. Peppell, being Bulletin No. 4 of the Geological Survey of Ohio.

From the UNITED STATES GEOLOGICAL SURVEY. 'Production of Iron Ore and of Manganese Ore' in 1905, being advance sheets of the *Mineral Resources* for 1905.——Bulletin 285 'Contributions to Economic Geology' for 1905.——Bulletin 284 'Report on the Progress of Investigations of Mineral Resources of Alaska.'——'Preliminary Report' on the operations of the Fuel-testing Plant of the United States. Geological Survey, at St. Louis, Mo., in 1905.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, October 10.

Con. Virginia	$0.94	Manhattan Con	$0.84
Ophir	2.90	Jumping Jack	0.56
Savage	1.30	Midway	2.15
Tonopah Ex	5.30	Montana	3.05
Belmont	6.00	Mohawk	3.80
Jim Butler	1.35	Silver Pick	0.87
Jumbo	1.45	Sandstorm	0.65

METAL PRICES.

By wire from New York.

	Closing Prices October 4.	Closing Prices October 11.
Copper—Lake (cents per lb)	20 @20.30	20.70 @21.30
" Electrolytic "	19.55 @19.95	20¼ @20.90
" Casting "	19⅜ @19¾	20 @20¼
Lead "	5.75	5.75
Spelter "	6.18 @ 6.20	6.15
Silver (cents per oz.)	68¾	68⅞
Quicksilver, per flask of 75 lb., San Francisco		$38.50
" " New York		$39@$40

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE new copper district of Greenwater is situated in the desert portion of Inyo county, California, about 60 miles south of Bullfrog, Nevada.

THE efficiency of a rock-breaker falls off rapidly when a reduction exceeding 4 to 1 is attempted, say, 8 to 2 in. cubes, and the same rule holds good for rolls.

FOR practical purposes it is safe to assume that a 9 by 15 in. Blake crusher, run at 250 rev. per min., will break to 1.5-in. size about 5 to 7 tons of quartzose ore per hour, with the consumption of 15 horsepower.

THE belt-conveyor is, for many purposes, the most efficient of the machinery used for conveying. It requires the least power to drive; its first cost is moderate, and the expense for repairs is comparatively small.

THE diamond-drill may be used for prospecting work in almost any kind of formation, and when the prospecting is carried on systematically, reliable results may be obtained at a minimum of expense by use of the core-drill.

THE cost of drying ore depends upon five factors: The percentage of moisture contained; whether fire-gases can be passed through it without injury; whether the ore be sandy or clayey; its ignition temperature; and, finally, the degree of dryness required.

THE simplest form of ore dryer is a series of cast-iron plates placed over a flue so that they will be heated below by the hot gases from the fire-place, each plate having a flange at its sides through which adjoining plates can be bolted together if desired.

THE cost of excavating earth with pick and shovel, and loading it, is about 40c. per cu. yd. for hardpan; 20c. for tough clay; 15c. for ordinary clay, gravel, or loam; and 12c. per cu. yd. for light, sandy soil—wages being reckoned at 15c. per hour in each case.

TO FACE the glare of a furnace or to protect the eyes from excessive light, it is not necessary to use colored spectacles or smoked glasses. Protection can be secured by making a small aperture in a sheet of paper or cardboard, using a pin or pocket-knife to make the hole.

AN effort is now being made to reform the ways of the Patent Office, which is far behind in its work. The Assistant Commissioner of Patents is lending his aid, so that it is hoped to remedy conditions that are detrimental to the interests of investors and industrial corporations.

AS a general thing the heavier wire is better for screens when treating coarse, gritty ore, but for soft, clayey ore, likely to choke the screen, the finer wire is preferable in a dry-crushing mill. For coarse screening, say down to 0.25-in openings, perforated steel-plate trommels of circular section give the best service.

THE answer to the question asking how many miner's inches of water can be carried through 9,000 ft. of pipe, the first 1,600 ft. of which is 18 in. diam. and has 90 ft. fall, and the remainder 11 in. diam., with a fall of two inches to the rod, is: Between 200 and 250 California miner's inches, depending on the kind and condition of pipe.

THE statement that a crystal of calc-spar consists of carbonate of lime, is quite true, if we only mean that, by appropriate processes, it may be resolved into carbonic acid and quicklime. If you pass the same carbonic acid over the very quicklime thus obtained, you will obtain carbonate of lime again; but it will not be calc-spar, nor anything like it.

IN order to increase the speed of a small engine that is running a stamp-mill, lag the driving pulley with a piece of belting so as to give the extra speed. Some throttling governors have a loose pin, so that by merely adjusting that, the speed can be changed. Another way would be to alter the governor pulley so that it will give the same speed of governor for a higher speed of engine. But the question always arises whether the steam-pipe and ports are sufficiently large to carry the steam without too much wire-drawing.

IN REGARD to the best method of keeping a record of the time lost in stamp-mills, we give that used in the Standard mill (at Bodie) when under the direction of R. Gilman Brown. On the post of each battery a pad is tacked; on this the millman records the time lost, noting the cause for each stoppage. Every day the head man reports to the office the time lost for each battery, proportioning the loss to the several causes. This daily sheet has a line for each battery, and would appear somewhat as follows:

Battery number.	*Hours run.*	*Hours lost.*	
1	22.30	0.30	*dress plates*, 0.40 lace belt, 0.20 set tappet.
2	22.00	0.30	" " 0.40 " " 0.50 tappet and screen.

Words in italics are printed, the others are written. It was intended to have a list of normal causes printed at the foot of the blank, with a letter or contraction for each, and simply use these in place of writing in full. In the office, the causes are segregated into certain natural categories corresponding to headings in the large office-sheet for the month, and they are entered daily in accordance with this system. All other details, such as renewals, supplies used, new shoes and dies, etc., are also reported on the daily sheet, and entered on the office sheet. The system is simple, and has answered all the requirements at the Standard.

IN REGARD to the treatment of a low-grade copper ore, calculating the copper as chalcopyrite and the balance of the iron as pyrite, the data furnished give an approximate partial analysis of 4% Cu, 20% Fe, and 23.4% S, making a total percentage of 47.4, leaving 52.6% to be accounted for. This 52.6% is probably silicate of alumina or silica. If the iron is present as pyrite it is probably not very strong in structure and the run-of-mine ore is likely to contain much fine stuff. The present practice is to screen out the fine ore up to about one inch size, the undersize going to roasters and the resulting calcine is smelted in reverberatory furnaces. The oversize should be smelted direct in blast-furnaces. There are several questions which would have to be considered before determining the proper metallurgy for this ore. The analysis is similar to the second class Bingham pyritic ore, although higher in Cu. Water concentration would hardly be considered, especially if some of the remaining 52.6% should be $CaCO_3$. With wood as fuel the entire run-of-mine ore should be crushed and rolled to about one-inch size and then roasted and the calcine smelted in reverberatory furnaces. Wood can be used as fuel in reverberatory furnaces with success. At Trail, B. C., in the early days, wood was the only fuel used in the reverberatory furnaces. It would also be wise to look up the manufacturer of producer gas from wood. In Mexico producer gas manufactured from wood has been used successfully in power plants.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Who Is a Mining Engineer?

The Editor:

SIR—In your issue of August 4 a letter, dated London, July 13, 1906, and signed 'Viator,' deals with the subject of mining quacks. The article gives the impression that the writer considers a full course in a college or school of mines indispensable in the making of a competent mining engineer; that without this training it is impossible for anyone, no matter how well endowed by nature in the gifts of reasoning power, perceptive ability and general common sense to become that— to some persons at least—vague, ambiguous quantity, known as a 'mining engineer.'

Speaking from the standpoint of one whose early technical education was neglected to such an extent that he does not know, off-hand, the meaning of the word which our London friend has chosen for a *nom de plume*, and who is furthermore an "ex-day's pay man," I venture to state that if a prescribed course in some college or mining school is the only avenue whereby a man may become entitled to the distinction of being considered a mining engineer, many of our best men in the mining business today would be unknown and their many merits and obvious worth unrecognized.

It is practically impossible for anyone who has passed that period of life when the luxury of a college course is usually indulged in, to enter school, do the term, and obtain his degree. What then, I would ask, is the man going to do who has been thrown upon the world and compelled to battle therewith to wrench therefrom a living, and who has nothing but his natural faculties and possibly the three Rs for an education?

If in the course of time he feels within himself a desire to climb to the higher planes of the mining business in which, by accident or design, he is engaged as a "day's pay man," and develops a thirst for knowledge along technical lines, is he to be compelled—by the limitations of his early schooling—to stand idly by while others, more fortunate in that regard, pass on and grasp the prize he feels should rightfully be open to him to compete for? Must he renounce and forego forever the cultivation of his mind and desist from acquiring information of a technical charactor because, forsooth, it has been declared by some person or body of persons that he may never embellish his name with the mystic characters M. E., and no one must take his word or his opinion for anything in mining matters on that account? As one who has served a long and tedious apprenticeship in the ranks of the toilers and who has, by dint of hard work and some perseverance, acquired at least a modicum of this much coveted fruit of the tree of knowledge, I beg to answer No! a thousand times No! If a man is worth the candle that feebly illuminates his place of work in a mine he will be quick to recognize the benefits that come of a technical education and will never rest until he has acquired at least a working knowledge of the technology of his business, and when he has done this I feel bold to declare that he is a better mining man and his opinion entitled to far greater respect than many of the listless, careless bunches of nothing that are turned out of our mining schools by the thousand every year and turned loose upon an unsuspecting public. True, they have run the gauntlet of professors and instructors and passed the examinations more or less creditably and can answer set questions on the various subjects embraced in their course very glibly, but their M. E. does not amount to a continental until they have gone forth and gained an intimate acquaintance with their business by coming in contact with the various phases thereof in actual practice and then give evidence of an adaptability for it.

Too many of our school of mines graduates had their profession chosen for them, and willy-nilly, they had to get in and dig at it and obtain their degree. In some cases unquestionably the selection of this business was a wise one, while in many instances the results would seem to indicate that a very serious mistake had been made, hence many of our misfits and nondescripts. In the case of our "ex-day's pay man," however, the case is very different. If a common miner thinks enough of the business, after having had perhaps many years of practical experience, to buckle down, of his own free will, to try and assimilate the hard dry facts pertaining to the theoretical side of mining, I think it is comparatively safe to assume that he is anxious to advance and to know whatever is worth knowing about the subject. Is it unreasonable, then, when he has qualified himself along these lines, that he should demand recognition among the other members of his profession? I think not, and I have yet to find a man who has attained any distinction as a mining engineer—in all that the term implies—who would refuse to recognize merit in a fellow worker simply on account of the fact that the latter had not had the advantages of a college education.

If my opportunities for meeting representative men of the mining profession have been so limited that I may not be permitted to form a proper conception of the way they feel on this matter, I hope I may never be undeceived, for I would very much dislike to be compelled to lower the high estimate in which I have been led to hold these gentlemen.

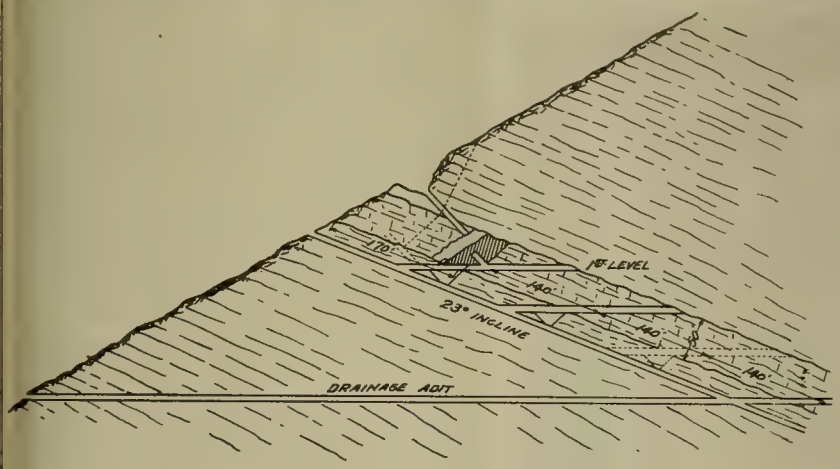
As to the probability of an incompetent ignoramus with a love for the use of "a multiplicity of high-sounding technical terms" deluding a business man, with money to spend and able to pay for the advice and opinions of a mining engineer, the idea seems to me to be too absurd to require a denial. Any man with the average amount of horse sense would readily see through such a palpable fraud as that of a man using language of that nature and terms indiscriminately jumbled together without rhyme or reason, and would know at once the kind of people he was dealing with. No sensible, intelligent human being would be fooled for an instant by a report so obviously ridiculous and self-contradictory as the one quoted by your correspondent and such a contingency, or the chance of it may, I think, be dismissed as not being sufficiently likely of occurrence to cause any alarm.

Going back again to the degree: As you state in your comment upon the article under discussion, the degree conferred by the college or school merely shows that the academic education has been acquired. It is, however, only the alphabet of a thorough mining education. No one would be chump enough to attach any value to the vaporings of one of these fledglings in regard to mining matters. The graduate is more than apt to find that many of the lessons taught in school were illustrated by ideal conditions, and when he goes out to fight and to conquer for himself, it will be strange if at first he does not fail to find things just as he had expected. Then it is that he finds the need of some practical education. This, of course, will come in time; but it takes time. He will find himself confronted by problems that the text-books do not seem to handle, and, as well as he remembers, the instructors must have overlooked; then, cast upon his own resources, he is obliged to put on his thinking cap, and, with the hard concrete facts before him, work

out his own salvation and make the most logical deduction of which he is capable.

To be worth their salt, the college graduates must get out and round out the education begun at school until they become mining engineers in the strictest sense of the term. This is attained by the harmonious blending, in the proper proportions, of theory and practice, be it acquired at the college, in the mine, or at the fireside after the day's work is over; and our greatest and best men are those who, whatever their early advantages, have gone on learning in the great school of experience until they are looked up to and respected because the world knows that they possess all the qualities and characteristics of the real, practical, efficient mining engineer.

It is far from my desire to deprecate the advantages of a thorough technical education and I am more than willing to admit the desirability of such mental training, but



Method of Working Inclined Orebody.

I do insist that the other type should have a 'look in' also, and that every man be estimated and judged not alone by the measure of his academic training, but by what he may be able to demonstrate he knows; that merit, and not fancifully embellished diplomas shall determine the degree of confidence to be reposed in him and the weight that shall be attached to his opinions and recommendations.

EDWARD W. RALPH.

Denver, Colorado, August 31.

Mining Method Wanted.

The Editor:

Sir—In your issue of May 19 there is a request for a method of mining a 50-ft. vein dipping at 23°, and as the problem is quite similar to one I have recently wrestled with, the following scheme is submitted. See accompanying sketch.

Sink an incline in the foot-wall parallel to the dip of the vein and about 25 ft. below, so as to leave room for bins over the shaft in the foot-wall. The first level should be opened at a depth of 170 ft. on the underlay and a cross-cut extended to the hanging wall. Other levels should be opened at about 140 ft. apart, so as to divide the distance to the drainage adit equally. A drift should be put through on the ore close to the foot-wall and a big leading stope taken off overhead and on both sides of the drift. Raises should be put through into the hanging wall at distances about 80 ft. apart. These should go up an incline of about 45 degrees to allow the waste to run and fill the stopes. The filling should be allowed to stand at a natural angle of repose and the back stoped down parallel, so that the ore will run down the rill into the chutes. Tunnel sets must be placed as the leading stopes advance and covered with lagging in preparation for filling.

Cross-cuts should be put out from the main drift a short distance to the right and left, from which the chutes are raised. When a chute has been used as long as ore will run to it, it is capped and covered with waste. Sills should be laid on the ore at the foot of the stope and closely lagged with long poles, so as to provide for coming up with the stope from below and breaking into the filling, if wanted. Following this method the 'glory holes,' from which the waste is secured, will be gradually deepened until the stope is in daylight, when, of course, the balance of the backs to the surface are simply quarried. This method can only be followed above the first level, below which more or less variation will have to be adopted.

The plan outlined by 'Prospector' of lowering the filling down an incline in the hanging wall is a good one, and could be used to advantage in connection with the above plan of stoping to any depth desired.

D. E. BIGELOW.

Melbourne, July 21, 1906.

Filter Machines.

The Editor:

Sir—In view of the scarcity of literature touching the Moore and Butters processes, some comment on Mr. R. Gilman Brown's recent papers may be of interest.

The process at Bodie differs from that at Telluride (as described in *The Engineering and Mining Journal*, July 7, 1906) in a notable point, the cake being blown off by air into a hopper instead of by water into the wash-vat. The latter method is distinctly advantageous as the strain on the filters is considerable, while air quickly enlarges leaks. Further, a stoppage of a few minutes caused, for example, by a circuit-breaker being thrown out, will cause a considerable portion of the cake to drop into the wash-vat, which is both inconvenient and expensive unless the vat is designed for pulp discharge. The photograph given by Mr. Brown shows that the baskets are likely to hang so unevenly that to use water, the basket being hung up, would consume much time or give a faulty discharge at the high end. The discharge of cake by water when the basket is immersed, is perfect, while discharge by air entails scraping at the edges. A great disadvantage of moving baskets is that an accident to the somewhat complex moving gear puts more than one basket out of commission, while, if the pulleys of the hoisting chains wear far, there is a chance of an awkward accident through a chain slipping one or more links. The ability to raise the baskets, however, facilitates replacing leaky filters. In the Butters process it is to be expected that the unmoved filters will outlast those raised and air-distended; but besides this we have an economy in labor. To raise and discharge a basket takes half an hour and the basket-man's whole attention, while in the Butters process his duty is mainly to turn the valves. With the charging and washing intervals given by Mr. Brown, two baskets would keep a man busy, while he would be badly overworked with quick charges like those obtained by Mr. Lamb on Goldfield ore.

H. W. GARTRELL.

Bisbee, Arizona, September 7.

Three Weeks in Mexico---VII.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Mexican mining terms are frequently distinguished by their aptitude. The hanging wall is called *alto* (high or up), the foot-wall is *bajo* (down or low). But in El Oro I found that the natives spoke of the hanging as *reliz* (pronounced like release). It is a word signifying a landslide or slip, and as suggesting a plane of parting or what a miner calls a 'shooting course,' it struck me as excellent. The hanging is also described as *reliz arriba*, or *arriba* by itself. Waste is *tepetate*. All stringers are called *hilos*, *hilo* being a thread. Ore that is speckled with black sulphide is known as *mosceado*, or fly-specked, *mosca* being a fly.



Placing Timbers in Position in the Stopes.

The ore, as it comes from El Oro mine, is handled expeditiously. At the main (incline) shaft there are two gyratory (Comet D) crushers, the oversize from which goes to a jaw (Reliance) breaker, 9 by 15 inches. Thence the ore passes into bins and from them it is fed onto a (Robins) belt-conveyor, which is made in sections as demanded by the length (about 200 yards) and the slope to the mill. At the mill the ore is delivered by the conveyor to a traveling tripper which distributes it automatically into the bins; the tripper moves over the bins the entire length of the mill and then returns.

When opening up ground previous to stoping, it is the custom to run a main drift in the middle of the hanging-wall orebody, leaving ore on both sides up to the top of the timbers constituting the drift-set. Then stoping begins above the drift for the full width of the orebody. When the ground begins to weaken and re-timbering has been carried as far as practicable, the stopes will be about half way up to the next level; then the drift in the foot-wall orebody is utilized, by driving cross-cuts from it to the hanging. These tap chutes wherever practicable, but if the ground near a chute has caved, then a new raise (from the lateral drift) is made to serve the purpose of extracting ore. Finally, when even the foot-wall begins to be bad, a lateral drift is run in the foot-wall country itself, and this sometimes finds unsuspected occurrences of ore.

Another procedure is to leave about twenty feet of ore above the top of the hanging-wall drift; the arch of ground being removed upon the final exhaustion of that block of ore. This method is employed when the maintenance of a roadway is vital, especially when approaching a shaft.

It is instructive to note that while the operating expenses at the Esperanza during 1904 represented 74% of the production, after the bonanza was struck the proportion of expenses decreased to 37%. The diamond-drill cut the new West vein in August, 1904, and the discovery was referred to by Mr. R. T. Bayliss at El Oro annual meeting in October, 1904, but the big rise in Esperanza shares did not begin until the spring of 1905. The story of the discovery illustrates anew how deceptive a single cross-cut can be. The West vein was cut by a cross-cut on the third level at a point 150 ft. north of the south boundary of the mine; the ore was poor, about 15 inches of stuff assaying 17 grams gold per ton. Next it was intersected in a drill-hole 900 ft. north of the place just described, but on the fourth level. Here also it was poor, about 18 inches, assaying 12 grams. This was done by the former Mexican company about four years before the eventual ascertainment of its real value. In August, 1904, the drill-hole put out by the new management, at the fifth level, cut the northern portion of the orebody and found 22 ft. of an average value of $37 per ton. But the cross-cut which was started at once on the track of the hole cut an 11-ft. vein assaying $75, the probable explanation being that the drill followed a cross-stringer connecting a poor vein 5 ft. thick to the 11 ft. of rich ore, there being 6 ft. of shale between them, so that the 22 ft. of core assayed $37 per ton.

The discovery is creditable to the management, as it was owing to their good judgment in the use of the drill. Now two drills are kept in constant use, although this manner of testing the ground is expensive because the quartz is hard on the carbons. The average cost is 5 pesos per foot of ⅞-in. core. A Sullivan E drill is used, capable of drilling 400 feet.

In the Esperanza mine, it is the custom to extend main drifts in the ore, which is hard and stands well. Although the shale is softer, it is found economical to keep within the ore, because this practice obviates timbering as the drift progresses. When the drift has been advanced the desired length—a month's or even two months' work, at 65 to 70 ft. per month—the ore is taken down on both sides and double drift-sets are put in place. When mining near the big fault, skillful work is required. On the upper levels the shattered ground is narrow, but this evidence of faulting increases, so that while it is barely one foot wide on the first level, it is 20 ft. wide at the fifth, where it is dangerous. In order to traverse this ground, not only is spiling required on top, but also on the side of the drift. The set is put in place in the customary manner, with cap, blocking and bridge, so that it looks like Fig. 1. The 'bridge' serves as a resting place for the spiling poles and allows space underneath for driving. Pointing the spiling upward and sharpening it

from one side, tends to lift the soft rock. When the spiling has been pushed on top and at sides, it is driven either with a sledge-hammer or, if that is ineffective, with a ram. If the roof-spiling needs this treatment, the ram is put on rollers. This ram is a piece of 8 by 8 in. timber, from 8 to 10 ft. long, so as to get a good run with it over rollers; if it is to be used for driving spiling near the floor, the ram is suspended from a roof-timber and thus it gets a swing. If the ground commences to run,

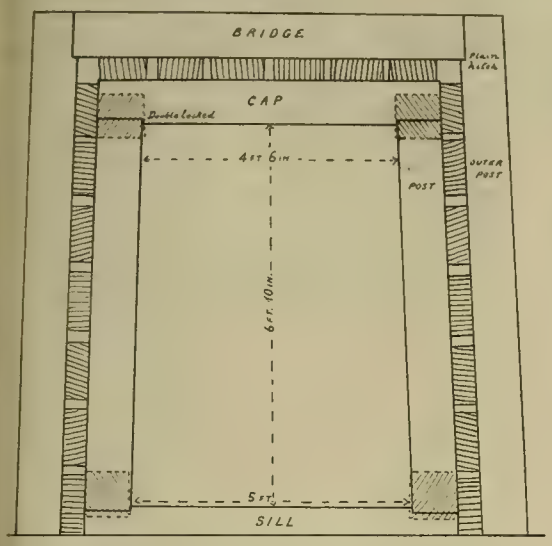


Fig. 1.

the face is bulk-headed with 4 by 12 in. or 6 by 12 in. planks, according to conditions. These breast-boards are then blocked by spiling, both on top and sides; the next step is to advance them. If the bottom one is advanced first, the ground would run, but if the top one is pushed, there is nothing to escape, because the top spiling holds

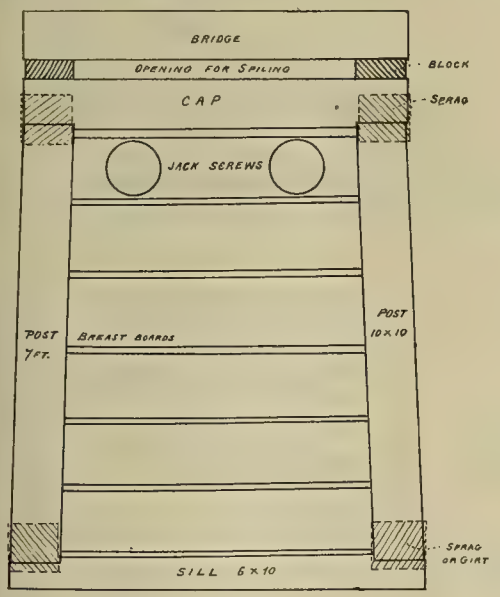
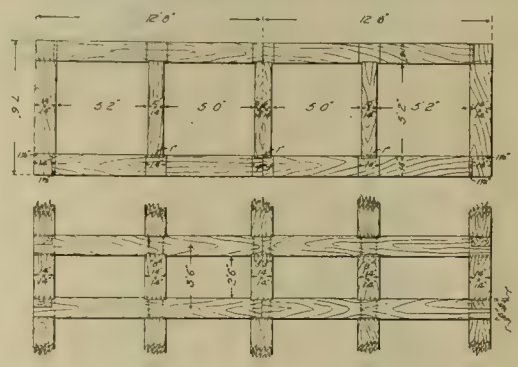


Fig. 2.

it back. Therefore, two jack-screws are brought to the spot and they are placed with heel (or base) on a cross-timber carried by the rear set. The top breast-board is now advanced 8 or 12 inches and a sawed-off block is inserted within the space thus obtained; this block holds the breast-board in its advanced position. The next board is pushed to a corresponding position, as before, cleaning out the cavity made, the soft ground being taken out over the top of the next lower board. This procedure is repeated with the other boards until they are all in line, marking a permanent advance of 8 or 10 inches or more, as circumstances permit. This is position No. 2. On the next advance, longer blocks are used to keep the breast-boards in place and the work goes on until room has been made for another set.

The north shaft is sunk through bad ground, particularly a length of 200 ft. between the third and fourth levels, and another stretch from the eighth to the ninth. There is a creep of 15 inches per annum, and it is found necessary to renew the timbering every nine months; this is done by a gang of *peones* specially trained under a Piedmontese foreman.

Double sets are used for timbering main drifts; all



Special Shaft Set; 14-In. Timbers.

the caps are double-locked to prevent splitting and, in rare cases, even the sills are double, when the ground underfoot tends to rise. In such cases an intervening block of ten inches is inserted, the bottom sill being the first to break. Ordinary sets would last only 60 days, the double sets are in service for 12 months; the top set

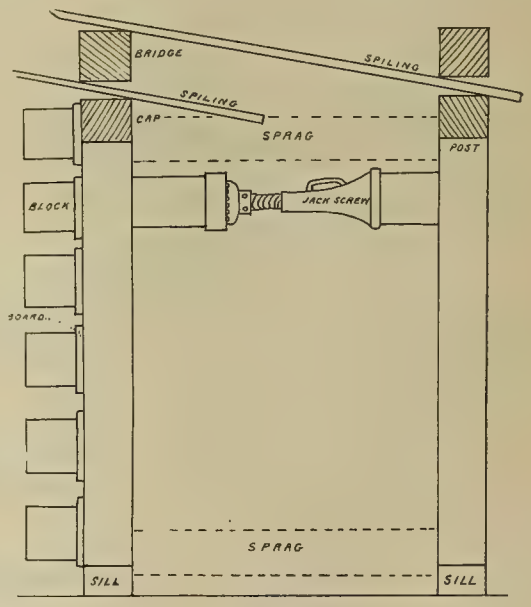


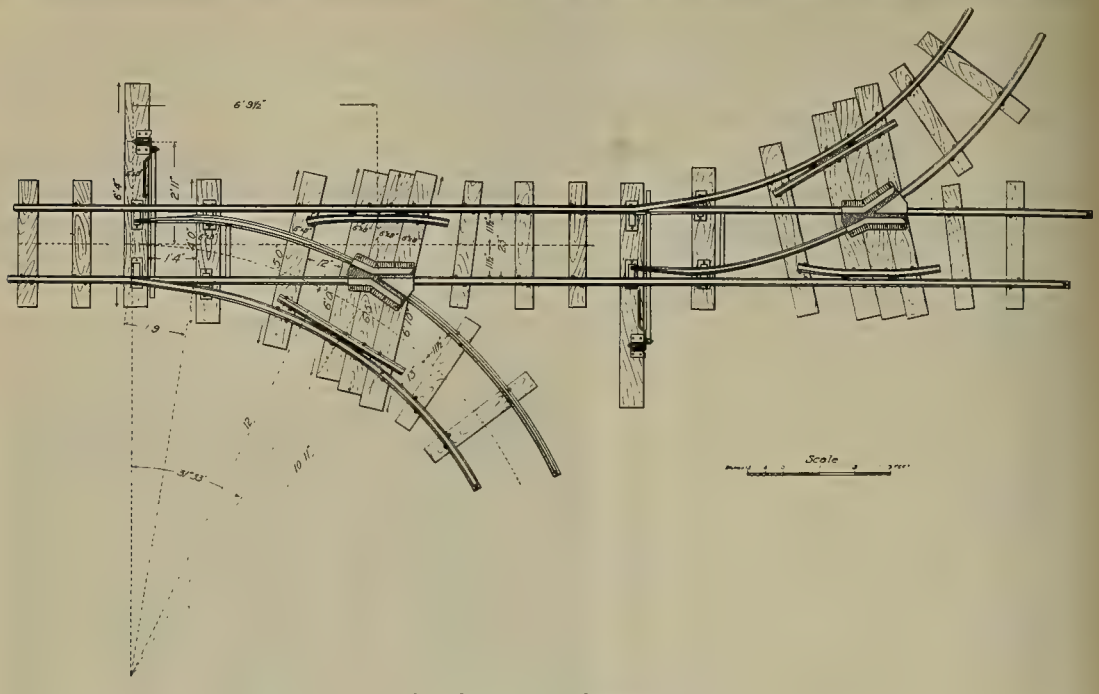
Fig. 3.

takes the weight and yields, without affecting the usefulness of the drift. The lower set remains unimpaired, until finally it is pushed too hard; then the pressure is taken by the erection of a false set, which, while the lower set is being replaced, does service as a top set.

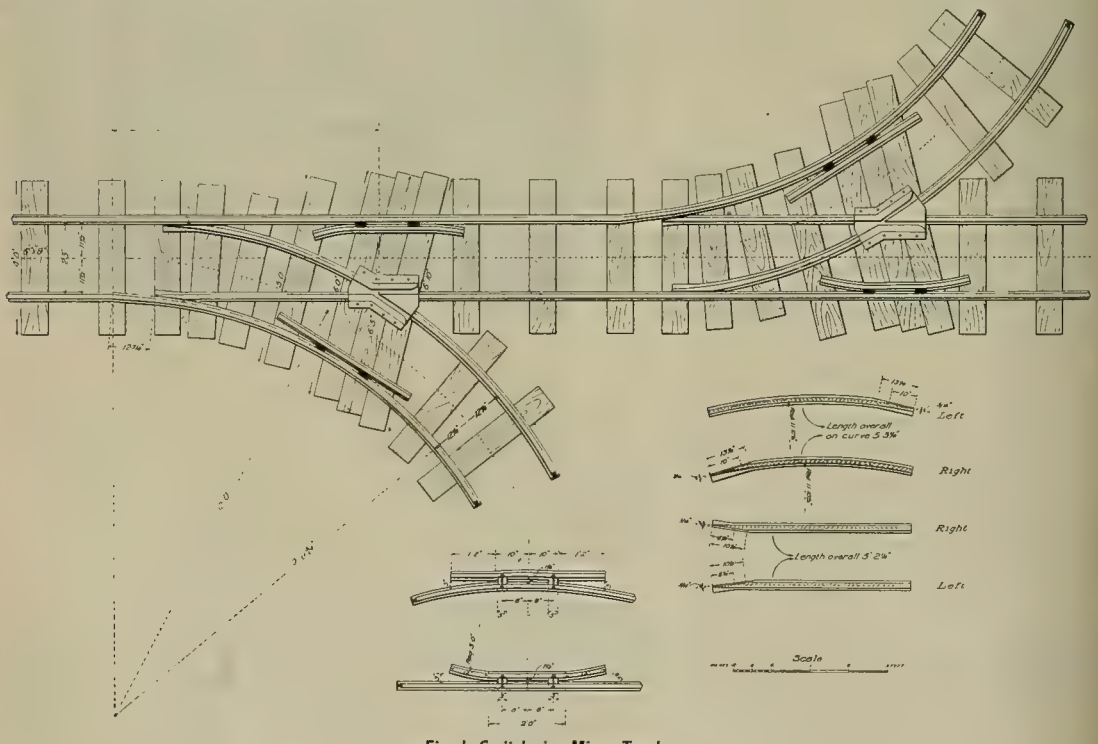
In bad ground it is the custom to leave from three to four inches between the lagging, so as to permit the

soft ground to come through, but not enough to block the tram-track. After this the ground is not eased further until the lagging breaks; it is then replaced by fresh poles. If the weight is from overhead, no effort is made to ease the pressure, which is allowed to break the timbers, to be replaced by fresh sets. The choice is between losing time in cleaning the track or letting the timber stand as long as possible before renewal. It is held that the question of blocking the track is paramount in a mine producing so large a tonnage of rich ore.

Where it is the intention to encourage the ground to get relief of pressure by pushing through the lagging, the space between poles is six inches. Close lagging requires more frequent renewal, but it eases the timbers. By allowing the sides to break through, more weight is thrown on the timbers, by the enlargement of the arch of ground overhead.



Split Switch. ○ Mine Locomotive Track.

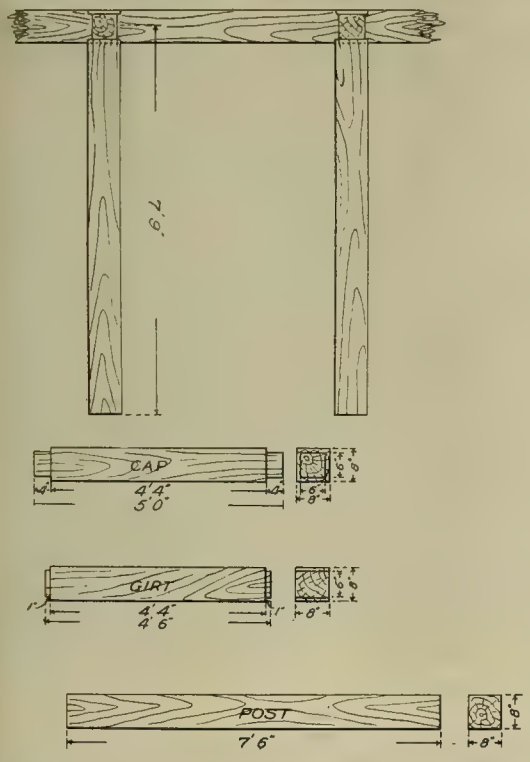


Fixed Switch in Mine Track.

Stope-sets are 5 ft. from centre to centre, with a height of 8 ft. They are so placed as to oppose the tendency of the walls to close, and the consequent strains are all accepted on the end of timbers.

Great care is taken with the tracks and admirable sys-

tem is exhibited in the arrangement of them. The cars weigh 1,100 lb. each and carry 2,200 lb., the total weight being 3,300 lb. The gradient is a half of one per cent, that is, it is such that the labor of pushing an empty car up-grade or of pushing a full car down-grade, is approximately equal. The width of track is 23 in., or 60 cm., the gauge being based on the metric system. The rails are 20 lb. per yard, and of Carnegie cross-section. The minimum curvature adopted throughout the mine is a 12-ft. radius, for which standard cast-iron right and left-handed frogs are used. Switch-points are carefully made in the Esperanza company's own shops; the points themselves being reduced in a planer instead of the customary blacksmith shop. All of these precautions tend to assure easy handling of heavy cars by inferior native labor. Special tools are provided for bending and punching the rails; all curves are laid to template. The ties are 2 to 2½ ft. apart and are made of 6 by 8 timbers. On curves the gauge is widened 1½ in., and the

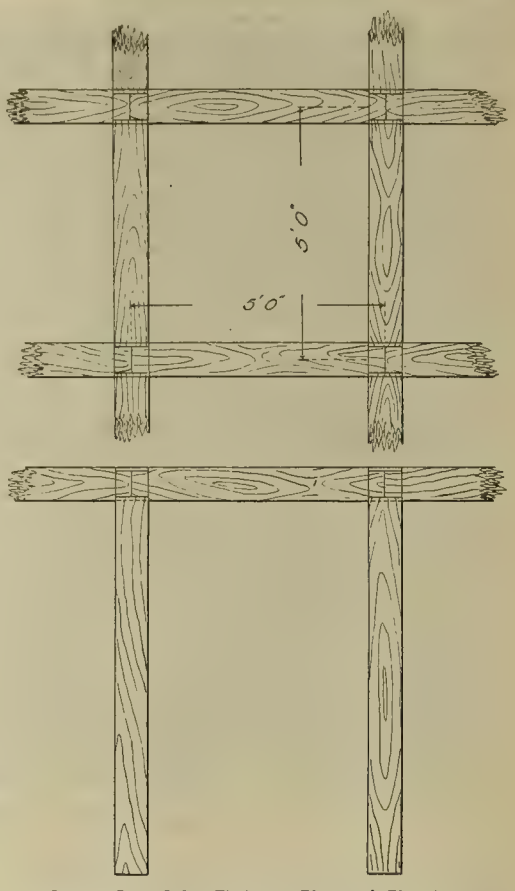


Square Set. 8-In. Timbers. Side Elevation and Details.

inside of curves is protected by a guard-rail; the same protection is provided at the points of all frogs. When using hand-cars, fixed points are laid down; but where electric motors run, the switches are made movable.

The Esperanza company maintains elaborate assay-plans. There is one for each floor in the stopes, the floors being 7½ ft. apart. On each plan the timber sets are marked in 5 ft. squares, every month's work is indicated by a different color and in every set the assay-value of that square of ground is marked in figures indicating grams of gold per metric ton. There is no assay for silver because the ratio between the metals is known from experience; in oxidized ore it is 6½ grams of silver to 1 gram of gold; in sulphide ore the proportion is as 15 to 1. Every car loaded with ore from a chute is grab-sampled at the shaft-station, the assays thus obtained giving the average value of the mine-output for that day, while the number of cars gives the quantity. Thus 350 mine-assays are made per diem, and these also enable the foreman to keep a check on the kind of ore being broken. Gangs of samplers, in pairs, test daily each working face in stopes and drifts; a sampler within the space of one set will get a chance to test more than one face, sometimes three of them. Both the moil and the pick are used; the ore is broken onto canvas spread underneath; the samples average 50 lb. apiece and are quartered down to 5 lb. each, before they go to the sampling room at the assay-office. All these returns are compared with the battery sample from the mill.

Taxes are heavy at El Oro. They amount, for instance, to 13% on the gross output of the Esperanza mine, but this includes State and Federal taxes, import duties, and the care of troops stationed in the district. On bullion the mine pays 2½% to the Federal Government and 1½%



Square Set. 8-In. Timbers. Plan and Elevation.

to the State.* All State taxes are subject to a second imposition of 25%, which goes to the Federal department. There is a wage tax, so much for each man on the payroll; there is a stamp-tax on every recorded business transaction; and there are duties on imports, particularly on dynamite.

On dynamite there is a tax of 243 pesos per ton. El Oro mine uses 185 cases, of 50 lb. each, per month. The Esperanza mine consumes 400 cases, or a carload in six weeks, so that the tax weighs heavily. It is intended to compel the mining companies to use the domestic dynamite; but the Mexican company's factory was blown up twice and they had ceased to manufacture at the time of my visit; nevertheless, according to the terms made with the Government, they had to furnish 60% dynamite at 19.34 pesos per case of 50 lb.—a rate fixed by the Government, as against 16.34 pesos, the old price. While the factory was in operation it cost 29.67 pesos to import the

*Gold, however, is now being purchased by the Government, and on bullion parted and refined in the country the Federal tax on gold has been removed, while the silver tax is reduced to 1½ per cent.

explosive from the United States; the company (Mexican National Dynamite Co.) was furnishing (in October, 1905) American dynamite for 19.34 pesos, but as soon as their factory resumed, it was expected that they would sell their own product at the same price. Americans mining in Mexico consider it to be unsafe and usually prefer to import dynamite at 29.67 pesos. Recently one of the leading companies at El Oro has made arrangements to buy from the monopoly, which furnishes American dynamite at about the same price as paid formerly. The management could not import the American powder direct, however, without paying the increased price. The monopoly is allowed to charge 16.79 pesos for 40%; 18.07 for 50%; and 19.34 for 60% dynamite.

The electric power used at El Oro comes from the Necaxa plant, on the river of that name, 176 miles distant. At the time of my visit the line was nearly completed. It has been built by Canadian capital. Mexico City is supplied with the same power, the distance being 100 miles from the falls to the city and 76 miles from there to El Oro, over the wires. There are eight circuits of three wires each between Mexico and Necaxa, and two circuits, also of three wires, from the city to the mines. Fifty thousand volts are delivered at El Oro, by a three-phase system, and it is expected that there will be an 8% loss to the city and an equal loss thence to the mines. The current does not go through a transformer at Mexico. Power is generated under a head of 1,450 ft. by a vertical-shaft turbine with the generator on top; the wheel is the invention of Escher Weiss, at Zurich (Switzerland). The hydrostatic head at Necaxa has been obtained by the building of an earth dam, 185 ft. high, 1,500 ft. thick at the base and three-fourths of a mile long; it holds 55,000,000 cubic metres of water and backs the river 2¾ miles. The transmission cable has a jute core and consists of six strands of No. 6 wire equivalent to No. 000 wire or 0.229 in. The power is sold to the mining companies on a sliding scale, the prices being graded according to the amount consumed, the lowest price being $50 per horsepower per annum to those consuming over 1,000 horsepower. Several times the natives have cut down the wires and stolen them, on two occasions as much as a kilometre was removed. This has been exaggerated by rumor to seven or eight kilometres. As soon as the cables were erected, a small current (generated by a steam plant at Mexico City) was put on, in order to prevent stealing; the result was that several *peones* were killed. Later, when one line had a current and the other not, the thieves seemed to know enough to distinguish between the dead line and the live one. The copper stolen is cut up and sold to the junk shops.

MELTING POINTS OF METALS.—Ice melts at 0° C. and 32° F.; under 760 mm. pressure it boils at 100° C., or 212° F. According to J. A. Harker, of the National Physical Laboratory, the following data give the melting points of the metals named:

Metal.	Degrees Centigrade.	Degrees Fahrenheit.
Tin	232	449
Lead	327	620
Zinc	419	786
Antimony	632	1,169
Aluminum	657	1,214
Silver	955	1,751
Gold	1,064	1,947
Copper	1,062	1,943
Nickel	1,427	2,600
Iron	1,503	2,737
Platinum	1,710	3,110

THE famous Burra Burra copper mine, in South Australia, is to be re-opened after 30 years of idleness. Five parties of tributers have started to work.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

THE drill-cores marked E. J. B. from Velardeña, Mex. are quartzite containing pyrite.

THE mineral from Santa Ana, Cal. marked W. W. H. is compact green chlorite containing nothing of value.

THE bluish tarnish on the pyrite crystals from Quartz, Cal. marked G. L. E. is probably due to a slight oxidation of the sulphide.

The rocks from Shoemaker, Los Angeles county, Cal., are: No. 1, Garnet; No. 2, Serpentine; No. 3, calcium carbonate (both pieces).

THE rock from Lakeview, Ore., marked L. H. H. is quartzite. If precious metals are present the amount can be determined by an assay.

The mineral from Hamil Station, Mono county, Cal., marked F. C., is silicious iron ore, containing sulphide and carbonate of copper—sink on it.

Rocks from Spokane, Wash., are: No. 1 and 2, Quartzite containing copper sulphide. The brown patches are also Quartzite stained by limonite. No. 3 is Graphite.

THE rocks from Chloride, Ariz., marked M. C. are: No. 1. Feldspar-porphyry; No. 2. Quartzite; No. 3. Aplite or granite; No. 4. Biotite-quartz-diorite; No. 5. Rhyolite-porphyry; No. 6. Granite; No. 7. Diabase; No. 8. Biotite-granitite; No. 9. Diabase; No. 10. Altered rock probably rhyolite, with biotite crystals.

THE mineral specimens from Spokane, marked A. R., are: No. 1. Cellular quartz with limonite stains; No. 2. Limonite resulting from the alteration of an iron-bearing mineral, perhaps pyrite; No. 3. Carbonaceous schist; No. 4. The yellow mineral is siderite. The other questions can only be answered from a knowledge of the local mineral occurrence.

THE rocks from Ibapah, Utah., marked J. S. L. are: No. 1. Hornblende-diorite. No. 2. Quartz-mica rock containing black crystals of tourmaline, probably an altered pegmatite; No. 3. Hornblende-biotite granite; No. 4. Rhyolite. No. 5. Rhyolite, altered and stained with red hematite; No. 6. A hydrous magnesian silicate, allied to serpentine; No. 7. Cuprite, the oxide of copper with malachite and chrysocolla; No. 8. Native bismuth.

The rocks from Slocan, B. C., marked W. C., are very much decayed and determination is accordingly difficult and uncertain. No. 1 is Diabase; No. 2 is not a typical rock. It was evidently a basic rock of some kind — probably diorite — but it is now altered to a nondescript mass of argillaceous and chlorite mineral; No. 3 is Talc-schist; No. 4 is much altered, but was originally a coarse Quartz-diorite; No. 5 is similar to No. 4, but has suffered more from surface decay; No. 6 is Diabase; No. 7 is Quartz-mica-diorite; No. 8 is a silicious dike rock and has somewhat the appearance of ore; No. 9 is a dark-colored Biotite-granite; No. 10 is an igneous basic rock, partly altered to Talc-schist; No. 11 is Quartz containing specular iron and pyrite. That marked A is a much altered magnesian rock. It contains considerable disseminated quartz. The occurrence of a fine silt-like limonite in this rock suggests the possibility of the presence of gold; B is similar to A, but still more like ore. C is Feldspar.

Shaft-Sinking With Small Machines.

Written for the MINING AND SCIENTIFIC PRESS
By ARTHUR B. FOOTE.

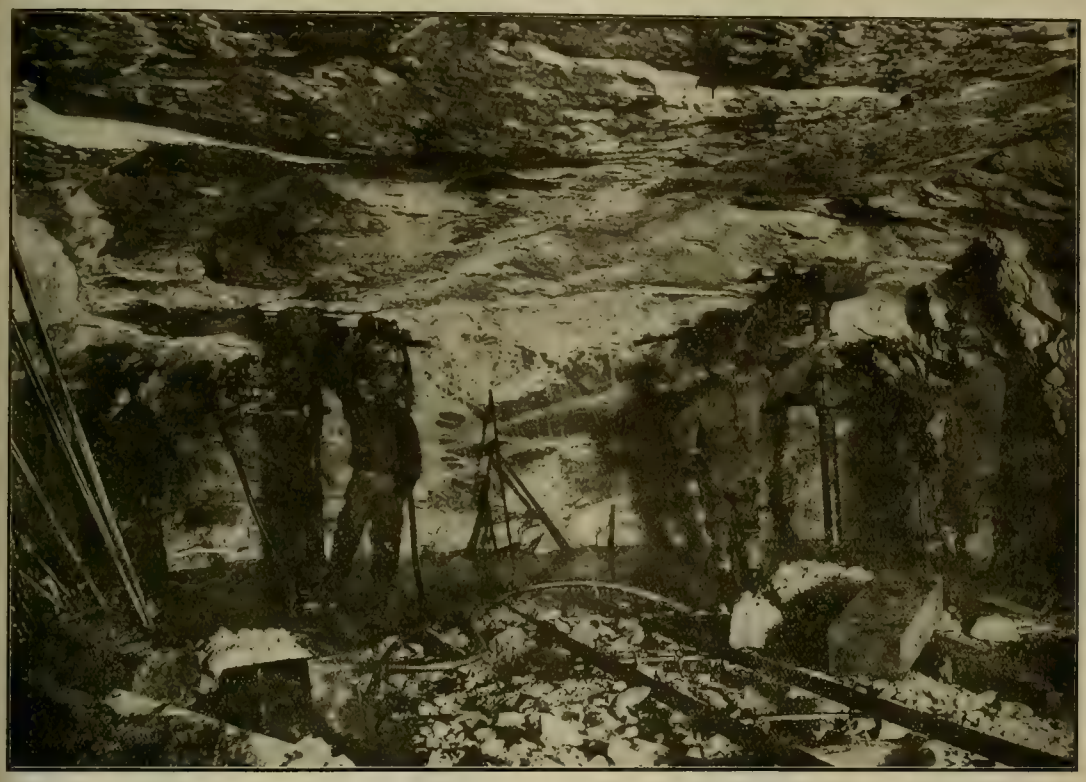
For the past six months the North Star Mines Co. has been extending its main incline-shaft from the 4,000-ft. level to 4,700 ft. A vertical shaft, 1,600 ft. deep, joins the incline at the 4,000-ft. level, and the skips operating in the vertical shaft continue down the incline, making the turn at the intersection through a curve of 30-ft. radius.

The incline-shaft, with which we are particularly concerned, is 18 ft. wide by 7 ft. high, and has an average pitch of a little less than 30° from the horizontal. It is in very hard rock, requiring no timber.

The work of sinking was carried on by a day and night shift. The mucking was done by the day shift, consisting of three miners and two car-boys, working from seven in the morning until five in the afternoon, while the drilling was done on the night shift by four machine-men who went to work at six in the evening and worked until they had drilled and blasted a round. This usually took until 4 A. M., but sometimes, if they got a late start, they did not go home until seven, when the day shift came on. The miners were paid $3 per day, the car-boys $2.50, and the machine-men $4.50. Any delay either in drilling or mucking was made up by the machine-men working 'long shift'—from four to seven in the morning—these men getting extra pay, with the understanding that they would do this when necessary. Only twice in the six months was so much time lost that it could not be made up in this way, so that it became necessary to lose a whole shift. Both times it was trouble with the sinking pump which caused the delay.

Four 2¼-in. torpedo drills, mounted on four arms on two six-foot bars, were used in drilling, the air being brought to the drills through two one-inch hose branching near the drills into four three-quarter-inch hose. Twenty-two holes six feet long constituted a round, unless the ground was found too hard to break to this depth, when shorter holes were drilled. These holes were usually blasted at about four or five o'clock in the morning, and by the time the day shift came on the smoke was sufficiently cleared out for them to go to work. It was found that by stopping the sinking pump, the water, rising and covering the face, helped to diminish the gas.

For getting rid of the rock, a single track was laid to within a short distance of the bottom of the shaft, branching there into two tracks to the bottom. These two tracks were kept extended to the face itself by two portable lengths of tracks, the rail-ends of which were tapered down and provided with wings so they would slide on top of the track already laid, thus making it possible to run a car right up to the face without splicing in short lengths of rail, or waiting until the dirt was all cleaned up. An automatic switch at the branch, thrown by the ascending car, always returned the descending car to the unoccupied track at the bottom. Thus there was always a car at the face being filled, first on one side of the shaft and then on the other, the hoisting rope being unkooked from the empty car and hooked to the other car as soon as loaded. The cars were of the standard round-bottom side-dump pattern used in the mine, of one ton capacity. A small geared engine, run by compressed air, hoisted the cars to the 4,000-ft. level, where they were dumped into the bins and the rock hoisted to the surface in the skips.



At the Bottom of the North Star Shaft.

The chief departure from the usual practice of shaft-sinking has been in the use of small or one-man machine-drills. It has usually been considered that with small machines the progress would be too slow, although possibly a saving in cost could be effected. It is believed that the following table of progress and costs will show that the speed in this instance is better than that usually

made by the use of large machines, the size of shaft and the nature of the rock being taken into consideration, while the cost is as low as is to be expected with the use of small machines. The figures are given only for the five full months that were run.

	March	April	May	June	July	Average
Feet driven	100	111	120	100	100	106
Tons hoisted	1,545	1,385	1,487	1,593	1,092	1,420
Labor per foot	$9.93	$8.32	$8.18	$9.00	$9.06	$8.90
Powder and candles per foot	3.05	2.65	2.99	3.01	3.20	2.98
Drills per foot	4.47	1.76	3.82	2.27	2.16	2.90
Tools, etc., per foot	2.07	1.03	1.89	1.12	.94	1.41
Tramming per foot	8.54	8.95	7.63	9.13	6.98	8.25
Timbering per foot	1.55	1.78	1.43	1.49	1.32	1.51
Hoisting per foot	2.96	2.63	2.91	2.90	2.07	2.69
Blacksmiths and mechanics per foot	2.83	2.52	2.62	3.33	2.59	2.79
Total cost of mining per foot	$35.45	$29.64	$31.47	$32.25	$28.32	$31.45

Mr. A. D. Foote is the manager of the mine, and the work has been directly under the supervision of Mr. Robert Walker as underground superintendent, and Mr. Richard Barry as foreman.

PORTLAND CEMENT is now manufactured in this country from the following raw materials—cement rock and limestone, limestone and clay or shale, marl and clay, and limestone and blast-furnace slag. In 1905, 52½ % of the portland cement manufactured in this country was made from cement rock and limestone, 36½ % from limestone, and clay or shale, and 11% from marl and clay. The manufacture of cement from cement rock and limestone is distinctly an American process, but both limestone and clay, and marl and clay, have been used for this purpose abroad. Cement rock is an argillaceous limestone. In New Jersey, for example, the deposit is in a narrow belt about 50 miles long and nowhere more than four miles wide. Cement rock contains from 65 to 80% carbonate of lime and from 15 to 25% silica, oxide of iron and alumina taken together. The early cement plants using clay and marl or limestone and clay all followed closely the European practice of cement manufacture, which consisted in finely grinding a wet mixture of marl and clay or limestone and clay and then moulding the mixture into bricks, which were burned in some form of upright kiln. Those plants using cement rock and limestone, however, found it impossible to get the fine crystalline mixture to cohere sufficiently to form briquettes which could be handled without crumbling. At one plant, therefore, a small percentage of cement was added to the mixture as a binder, while at another plant coal tar was used for this purpose. The use of cement rock as a raw material and the employment of coal tar as a binding material constituted the first advancement of American over European practice.

DETERMINATION OF BISMUTH.—A satisfactory method of determining bismuth consists in adding to its solution in nitric acid strong ammonium phosphate solution in slight excess. $BiPO_4$ is perfectly insoluble and withstands ignition. The filter-paper must be burned separately. In presence of Cu or Cd, some excess of HNO_3 must be used and the $BiPO_4$ should be boiled with decinormal HNO_3, which is then re-treated with Am_2HPO_4 to recover the trace of dissolved $BiPO_4$.—L. Moser, *Journal of the Chemical Society of London*, March, 1906.

THERE is a prevalent idea that the constructive genius is in itself something grander than the critical, even though the former turns out to have merely made a symmetrical rubbish heap in the middle of the road of science, which the latter has to clear away before anybody can get forward.

Cobalt.

Written for the MINING AND SCIENTIFIC PRESS
By J. A. MACDONALD.

There is a popular idea that the Cobalt boom is over because some five thousand green prospectors were chased out of the district this spring by a combination of bad luck and black flies. Up to the latter part of July, the black flies, mosquitoes, and sand-flies were so rife that they made prospecting in the thick bush almost impossible. Added to this, the new prospectors, instead of spreading out over the country, confined their operations principally to the area around Cobalt, which has already been thoroughly examined on the surface. Those who hope to make strikes in that vicinity now must trench for discoveries. Any uncovered outcrops were all located last summer.

Another feature which tended to dull interest in the camp was the determination of the mine owners not to ship any more ore to the smelters in New Jersey. Last year they were forced to sell their ore in order to realize enough money to declare dividends and provide for development. But they recognized the fact that it was robbing their mines to send ore to Jersey City, because the smelter paid only for their silver and kept all the rich by-products, such as cobalt, nickel, and arsenic, which are associated with the silver found in Cobalt. This summer, however, all the large mines are storing their output and waiting for the completion of the smelter now being rapidly brought to completion at Hamilton, Ontario. Last month one well-known property had 200 tons stored that would assay from $1,000 to $1,500 per ton, and another had over $1,000,000 worth of ore either broken or blocked out. Meantime most of the companies are clearing the surface of their properties and, in doing so, they are finding rich veins under the grass-roots. In nearly every case a large number of new finds have been made adjacent to the shafts already sunk and some of these are even richer than those that are being worked. The Jacobs company has a new vein exposed for a length of over a hundred yards; this is eight inches wide and almost pure silver. The latest big discovery reported is on the Nipissing property; the vein is alleged to be five feet wide and is uncovered for 50 ft. Prof. W. A. Parks, of Toronto University, who has just returned from Cobalt, is authority for the statement, and is said to have personally measured this astonishing find. The Nipissing company can have no object in putting forth a canard, because that mine yielded $1,600,000 worth of ore for the year ending April 1. The general result of stoping the operations this summer has been that the score of recognized mines are found to be richer than at first supposed. On the outlying claims around the magic circle of shipping mines, a considerable number of companies are engaged in what the old-timers term 'perpendicular' prospecting. That is, instead of examining the surface of the claims by trenching, they are sinking expensive shafts on insufficient data in the hope of striking it rich down below. The experience of the camp is that unless you can strike it on the surface, there is not much use going down with a shaft. A goodly number of these 'perpendicular prospectors' are likely to lose their money, which, if employed in less spectacular work, might have resulted in success.

A large number of the experienced prospectors, however, have gone north along the Temiskaming & Northern Ontario Railway, which runs through the heart of the Cobalt district, and a strike of gold has been made, about ten days ago, 85 miles north of New Liskeard, assaying several thousand dollars per ton, and a rush for that locality has now commenced. This is the first find

of gold of any importance, and the yellow metal has an attraction very much greater than that of silver.

With the finding of the great big nugget of silver at Cobalt a short time ago, which weighed 800 lb., 70% being silver, worth something over $5,000, there has been a great rush of people, mostly American capitalists, to Cobalt. Last week a number of New Yorkers, having their own private car, came into Cobalt to speculate. A great many men from across the border, having a little money, come daily to Ottawa with the intention of prospecting for themselves, expecting to hire an experienced miner to go in with them. Last week the proprietor of a milk-sugar factory in central New York left his factory to other hands, and came to Ottawa. Seeking out the writer, he asked to be put in acquaintanceship with a good, honest prospector to 'go in' with him. Such a man was found, but these prospectors have so many applications of like nature that their terms are almost prohibitive. This prospector demanded from my New York friend a monthly wage of $50 and a one-third interest in any find, the green man with the money to pay all the expenses, such as the purchase of a canoe, tent, blankets, shovels, picks, and a supply of provisions. The man from New York was a little timid, and thought the 'lay' was too one-sided. He has not yet closed a deal with the prospector. He was assured, however, that a two months' prospecting trip into Cobalt would not cost much over $200, which is not a large sum to lose even if no finds are made.



From the *Engineering Magazine.*

1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Trethewey Silver-Cobalt Co.
4. Conlagas Mining Co.
5 & 5. A. McKinley-Darragh-Savage.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson-Cobalt Silver Co.
11. Kerr Lake Mining Co. (Jacobs).
12. Drummond Mines Co.
13. White Silver Co. (Hargraves).
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co. (Knight).
17. Violet.
18. Star Silver-Cobalt Co. (Nova Scotia).
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay Co.

Under force of circumstances the Government of Ontario has now gone into mining in Cobalt, the profits to go to the Provincial Treasury. The reason for this is that the Gillies timber limit is a sort of silver elephant on the Government's hands. The Gillies timber limit is a large tract of land, just south of the town, which was sold some years ago to the Gillies brothers, lumbermen, for its timber. It is now known that the Gillies limit contains, besides timber, large quantities of silver ore. Gillies will, of course, be allowed to take the timber, but he has no right to the land or the silver ore therein; and to permit prospectors into this territory would mean the destruction of the timber, and an infringement upon private rights; so the Government of Ontario has decided to develop this area on the fringe of the town for the benefit of the people of Ontario. Undoubtedly there is great mineral wealth in the Gillies timber limit. On the northeast corner of it there is a silver vein on the surface nearly six inches wide, and very rich. It is only uncovered about 50 ft., but the vein alone makes the lot on which it is situated worth several hundred thousand dollars, just as it stands. This is only in one small corner. That may constitute a mine worth millions of dollars, the output of which may extend over a long period of years. Moreover, it is to be noted that the supposed rich part of the Gillies limit is larger than the whole producing area around Cobalt.

There is no reason why the Government should not dig enough silver out of the vein already discovered to secure funds sufficient to prospect thoroughly the entire tract on behalf of the people of the Province. The ground has already been clandestinely prospected by hundreds of men in defiance of the law, and if their reports are to be believed, the northern part of the limit has "millions in it." Some of the 'finds' have been staked and restaked a dozen times over, while many of the best discoveries have been covered up, awaiting the day when the Government would open it for legal staking of claims. It is generally conceded that if the tract were thrown open in the ordinary way, there would be disorder and even bloodshed. When the time came to file, every claim would have a dozen claimants, and in cases where millions were involved, endless litigation would cripple development for a long time. The only feasible solution apparently was for the Government to retain the property and develop the mineral resources itself.

J. F. KEMP holds that water under great load or pressure does not expand according to the 4% rule (that is, 4% for 100° C). On the contrary, it may be held by the pressure at fixed volume, despite the added heat. If, for example, we roughly assume a column of water 1 sq. in. in cross-section and 2 ft. high (it is really about 2 ft. 3½ in.) as equal to a pressure of a pound to the square inch in 10,000 ft., we would have pressure of something near 5,000 lb., or over two tons to the square inch; and in face of this, the expansion of water from an added temperature of 100° C. practically becomes a negligible quantity as contributing to hydrostatic head.

THE great tragedy of Science is the slaying of a beautiful hypothesis by an ugly fact.

The American Mining Congress.

Communicated by its Secretary, J. F. CALLBREATH.

The amendments recently adopted by the American Mining Congress mark the beginning of a new era for that organization. Heretofore its work has consisted almost entirely of holding its annual session, at which matters of importance were discussed and resolutions adopted embodying the concensus of opinion, through the influence of which a number of reforms have been accomplished. With the creation of permanent headquarters at Denver the work of the Congress was enlarged and plans were made for the creation of a permanent exhibit of commercial ores of the whole country, a complete mining library, a laboratory for qualitative analyses, a bureau of information on all subjects in connection with mining, and a compact organization through which the problems of mining might be solved—all these so planned as to help the practical mining man and attract the novice. It is also planned to furnish such information to intending investors as would serve to guard them against palpable frauds, and place mining on an investment rather than a speculative basis.

These plans could not be carried out without considerable expense, and the provision made for the expense of an annual convention only was found to be entirely inadequate. Again it was found that the fixing of permanent headquarters at Denver created the impression that the Mining Congress was liable to become a Denver organization, rather than serve the broad purpose of a national institution with which the mining men from every section of the country could co-operate and to which all could turn for assistance in the solution of those problems which require united action and which are of general interest. Another weakness of the old plan lay in the fact that the Directors, necessarily widely separated and busy men, could not hold frequent meetings, and the responsibility of decision of many matters of importance must of necessity be left to the Secretary.

These problems have been met by the recent amendments providing for an Executive Committee with power to act in the interim between meetings of the Directors, and for the increase of the annual dues from $2 to $10, which is believed to be sufficient to meet the necessary expenses; not so high as to prohibit the membership of any reputable mining man and yet high enough to keep out unworthy men.

The third objection was met by an amendment to the by-laws which limits the power of any one State to control the organization. Under this clause Colorado, with one thousand members, would have no greater influence in the selection of the governing body than Oregon, Washington, and Idaho, with thirty members present at any annual meeting. That this amendment should have been passed by the unanimous vote of the Colorado members present at the recent meeting of members, indicates the desire on their part to foster a national organization on broad comprehensive lines.

For the protection of the mining investors of the United States, the American Mining Congress has established a Bureau of Inquiry, through which information can be obtained as to the condition of the property and the standing of the company that has asked or is asking for the money of the investor. This Bureau of Inquiry will be absolutely impartial in its findings, its sole purpose being to prevent ill-advised mining investments and to save the West from the disgrace which follows dishonest mining promotion.

In order thoroughly to eradicate fake promotion, the American Mining Congress is pledged to give to inquiring members information absolutely unbiased, collected from unprejudiced sources—largely its own trusted correspondents—and to have but one end in view, namely, the protection of the investor, its belief being that every dollar improperly invested is a damage to all legitimate mining, and that the highest good of the mining industry may be served by warning investors against improper investments and furnishing such information as will guide them into channels which give promise of success.

A bill providing for the punishment of all mining fakirs and promoters of illegitimate mining enterprises will be drafted by the American Mining Congress at its annual session which will be held in Denver, Colorado, October 16 to 19 inclusive. A committee has been appointed to prepare and submit to the Mining Congress a draft of such bill. This committee comprises two United States Senators, Robt. M. La Follette (Wisconsin) and Fred T. Dubois (Idaho); one Congressman, Eben W. Martin (South Dakota), and the Governors of two States, Geo. C. Pardee (California), and Jos. W. Folk (Missouri). Four are attorneys and all are from mining States of prominence.

Prevention of Fraud.

The last Legislature of the State of California passed an Act which has now become law, providing that:

SECTION 1. Any superintendent, director, secretary, manager, agent, or other officer, of any corporation formed or existing under the laws of this State, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent, or other officer, who shall wilfully subscribe, sign, endorse, verify, or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation or its stock, any untrue or wilfully and fraudulently exaggerated report, prospectus, account, statement, of operations, values, business, profits, expenditures or prospects, or other paper or document intended to produce or give, or having a tendency to produce or give, to the shares of stock in such corporation a greater value or less apparent or market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by imprisonment in State prison, or a county jail not exceeding two years, or by fine not exceeding five thousand dollars, or by both.

SECTION 2. All acts and parts of acts in conflict with this act are hereby repealed.

A German-Canadian syndicate proposes to build a cobalt smelter on the Temiskaning and Northern railway. It is stipulated that the German process to be used must be kept secret, and the experts to be Germans. The works will be started with the wet and dry process, first a concentrating plant to treat low-grade ores, then a cobalt oxide works, and lastly a roasting plant. In Germany 52 per cent of the world's production of cobalt oxide is used, and the German superintendent guarantees a market for 100,000 lb. annually.

THE Koreans make excellent miners and laborers, and they are cheap. An assayer informs us that his furnace-man considers himself well paid at $4 per month, without board. Miners get from 20 to 25 cents (gold) per day, though even less is paid in certain districts. The Korean as a miner may not be as good as a white man, but he is far ahead of both the Kaffir and the Chinaman. By way of comparison it may be said that four Koreans will do the work of three white men.

Ore Treatment at the Combination Mine, Goldfield, Nevada.

II. The Mill.

Written for the MINING AND SCIENTIFIC PRESS
By FRANCIS L. BOSQUI.

In considering a mill for the combination mine, it was thought that the size of the property would hardly justify the initial installation of more than ten stamps. The plant, as completed, is unusually large for such small capacity. An extensive and costly equipment was made necessary by the elaborate process required for the best recovery, and by the decision of the management to reserve one-half of the mill for the treatment of custom ore. The latter required one complete and separate unit; thus the whole plant was spread over a greater area than would otherwise have been necessary. The outlay, however, has been amply justified by the efficiency of the machinery, and the high recovery obtained.



Mill of the Combination Mines Co., at Goldfield, Nevada.

The lack of grade for millsite introduced several problems into the construction which have necessarily affected the cost of treatment, namely, the elevating of ore to the bins, and the elevating of pulp to classifiers. The water problem, however, was solved at the start. The water is obtained from springs situated about ten miles west of the mine, and is pumped to the mill against a head of about 800 ft. at a cost of 0.1c. per gal. It is hot as it comes to the surface and carries about 0.1% sodium sulphate and a trace of sodium chloride. Though slightly brackish, the water is potable; and for milling purposes the sodium sulphate is beneficial in assisting the settlement of the slime.

The ore is trammed from the shaft to storage bins, from which it is delivered to a platform above a 10 by 16 Sturtevant roll-jaw crusher, where it is mixed with the required amount of lime, varying from 5 to 10 lb. per ton. The crusher reduces the ore to about one-half inch size. The lack of fall made the interposition of a sorting grizzley impossible. Everything passes to the crusher and is delivered direct to a 12-in. belt-conveyor set at an angle of 20°, which elevates the ore to the mill-bins. There are four of these bins for the four units of five stamps each. (Ten more stamps have recently been added for treating sulphide ore.) The point of discharge at the top of the mill is shifted by means of the usual form of adjustable carriage. The ore is fed from hanging feeders, attached to the bins, into the low mortars of the Boss cantilever battery system. This type of battery frame and mortar was described in the MINING AND SCIENTIFIC PRESS, of February 17, 1906.

In the following description of the milling system, I shall first take up the treatment of the oxidized ore, which is carried on by the original ten stamps and cyanide annex. As already explained, the mill was divided into two separate units for the purpose of treating custom ore. Very little custom ore, however, has been received; and recent favorable developments in the mine have decided the management to devote the entire mill to their own ore. In the following account, a complete five-stamp system will be considered. The scheme of treatment is exhibited diagramatically in Fig. 1.

Inside amalgamation is carried on by means of a curved plate screwed to the chuck-block. The ore is crushed through 12-mesh wire screen. Outside the screen a splash-plate is used. From this plate the pulp falls to a lip-plate about 12 in. wide, with the front edge slightly bent down, giving the pulp a gentle drop to the apron-plate. There are three plates to each mortar, arranged in steps, giving an amalgamating surface 53 in. wide and about 12½ ft. long. The whole tray, by means of wheels and track, can be shifted during the clean-up of the battery, as shown in Fig. 2 and 3.

At the bottom of each tray is a small cone hydraulic classifier, which separates the coarse mill-pulp into two products: (1) Fine sand and slime, which passes to the outer discharge lip of the Bryan mill and thence direct to the concentrators; (2) coarse sand, which passes to the Bryan mill for re-grinding.

The ore being extremely hard and tough, is crushed with 1,350-lb. stamps, falling 100 times per minute, with a 6-in. drop. In spite of this, however, the stamp-duty is only 3½ tons, using a 12-mesh screen. One of the 5-ft. Bryan mills, running at half speed, takes all the coarse

sand, from 10 stamps (approximately 20 tons per day), and crushes it through a No. 9 slotted screen, equivalent to 40 mesh. The final product from the Bryan is passed over two 6-ft. Frue vanners and two 6-ft. Triumph tables. From these concentrators the pulp is raised by two 54-in. Frenier sand-pumps to two sets of cone classifiers. This system is a modification of that introduced by Mr. Merrill at the Homestake cyanide plants. The top cone takes the intermittent discharge from the sand-pump and is so adjusted by valves that it sends a fairly uniform flow of pulp to the two smaller cones. The top cone is not a

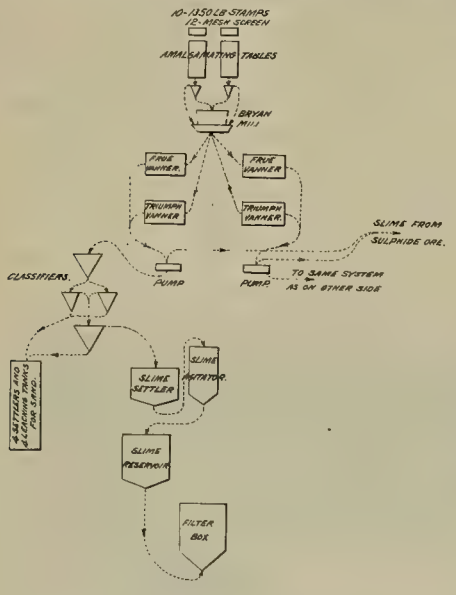


Fig. 1.—Treatment of Oxidized Ore.

classifier. The first rough classification is made in the small hydraulic cones, from which a stream of sand flows direct to the sand vats. The overflow from these small cones, consisting of slime and fine sand, flows to the larger lower cone, where a closer classification is made.

good (over 95%) since the introduction of the Butters-Cassel filter. A contemplated re-arrangement of the cones is expected to improve the extraction from slime.

In a small mill, classification requires constant attention. Slight interruptions, the suspension of one battery unit, or any variation from normal operating conditions, at once affect the flow of pulp in the classifiers, which are dependent upon nice adjustment for their efficiency. Obviously, the larger the mill, the smoother will be the operation of this system, and the less attention will it require.

From the cones, the sand flows to a pipe distributer and thence to a settling vat, of which there are four on each side of the mill. The fourth vat was added after the completion of the mill. These vats were at first provided with an overflow lip and a circular launder to carry off the surplus water. It was found, however, that occasional irregularities in classification resulted in the settlement of slime in these vats, which interfered with

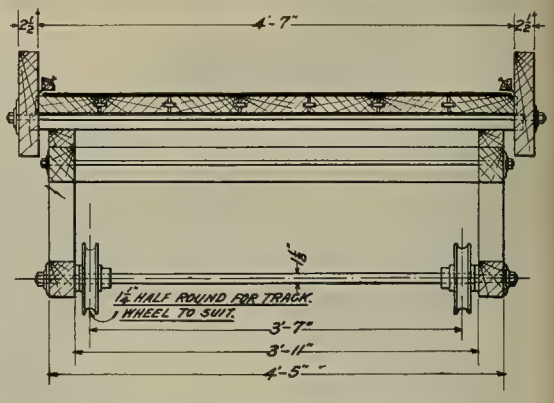


Fig. 2.—Cross-Section of Amalgamation Table.

percolation. The settlers were then fitted with slime-gates, and the overflow from the sand-settlers, carrying a certain amount of slime, now runs to a centrifugal pump at the lower end of the mill, to be sent to the slime-settlers for clarification. This is an awkward

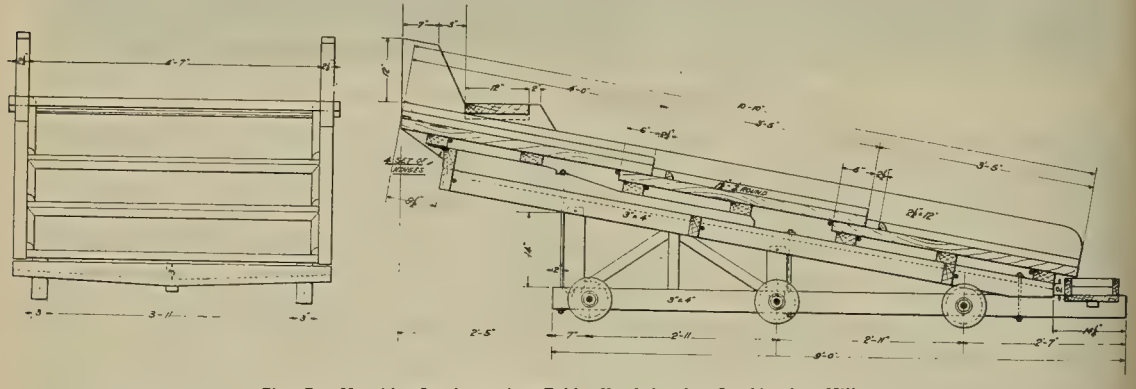


Fig. 3.—Movable Amalgamation Table Used in the Combination Mill.

The stream from the bottom of the latter also flows to the leaching vats. The overflow from this large lower cone passes to the slime settlers.

The pulp from the Bryan mill may, therefore, be said to consist of two products, namely:

1. Sand	Retained on 100 mesh.....41%	}	67% of total.
	Passing 100, retained on 200...35%		
	Passing 200 mesh.....24%		
2. Slime...	Passing 200 mesh.....90%		...33% of total.

This is not considered an ideal separation, inasmuch as the slime carries a large amount of fine sand. In spite of this, however, the recovery from the slime has been very

arrangement, but was unavoidable owing to the small gradient of the millsite.

When the sand settler is filled, the surplus moisture is removed by a Gould vacuum pump, and the charge shoveled to the treatment vat below. Here the charge is given an eight days' treatment with a 0.1% and a 0.2% cyanide solution, and the residue discharged by sluicing through a central bottom-discharge door.

The slime is delivered to the centre of a conical-bottom settler, provided with a rim overflow. There are two of these settlers on each side of the mill. Each is alternately allowed to fill and overflow for 12 hours, and allowed 12

hours for settling. A pipe decanter carries off the surplus water, leaving the slime with about 50% moisture. Sufficient strong cyanide solution is added to the charge of slime to make a solution of from 0.15 to 0.2% cyanide, and to give the pulp a consistency of three parts solution to one of slime. By means of a centrifugal pump, the pulp is transferred to an agitator, with a steep cone-bottom. By means of valves, the same machine (a 3-in. Krogh slime-pump) is applied to the agitation, taking the slime from the bottom of the vat and throwing it back at the top. A supplementary agitation is given by means of a mechanical stirrer revolving slowly. The pulp and stirrer give an ideal agitation, being sufficiently complete for the best results. The pump, which has a lift of about 10 ft., is run at 375 rev. per min. Thus, at short intervals, the whole content of the vat passes through the pump, where it is aerated by means of a pet-cock on the suction pipe. The stirrer prevents the settlement of fine sand at the junction of the cone bottom with the staves, and keeps up the agitation during pump repairs. The only repair required in the pump is the replacement of the shaft about once per month. The objection urged against the centrifugal pump as an agitator—that it is apt to clog with slime during stoppages—is not a sound one. The 'slime' product at the Combination mill carries a large amount of fine sand, and the pump has repeatedly been started up after stoppages of several hours, without the least trouble.

After agitation, lasting from 12 to 18 hours, the pulp is discharged into a slime reservoir, a vat of large capacity provided with a mechanical stirrer from which it is drawn, as required, for filtration in the Butters-Cassel filter.

A filter-press was at first used for filtering the slime. This was an American machine consisting of fifty 42-in. plates and 2-in. distance frames, and had a capacity of 2½ tons of (dry) slime. It was evidently made of poor material, as it was the source of exasperating trouble through breakage. The plates were continually cracking under a pressure much below the guaranteed maximum, and the outlet-cocks getting out of order or breaking. Moreover, the operation of pressing, washing, and discharging was extremely slow, requiring about five hours, and the operating expense high, requiring two men on each of the three shifts at the prevailing laborer's wage of $4 per day, to say nothing of the cost of filter-cloths. It is fair to suppose that one of the high-class foreign presses of the Dehné type might have given better satisfaction. At best, however, filter-pressing is not to be compared with the system now in use, especially as regards cost of operating, and the completeness of the washing operation.

The essential points of difference between the Butters modification of the Cassel filter and the other vacuum-filtering schemes are the extreme simplicity in the design of the filter-leaf or frame, and the fact that these frames, throughout the operation, are always stationary. In the Combination plant there are 28 frames (5 by 10 ft.) set 4½ in. apart in a box 10 ft. square with a pointed bottom inclined at an angle of 50°. The slime-pulp is introduced at the point of the box, and a vacuum of 22 in. of mercury is maintained for about 20 min., during which time a cake is deposited on each side of the frame ¾ to 1 in. thick. The surplus pulp is then withdrawn to the slime reservoir and the wash introduced, consisting of a weak solution of cyanide. When the cakes are thoroughly washed, the weak solution is withdrawn into its proper vat, and water introduced, until the frames are completely immersed. The object of this final water is to assist in removing the cakes. More water is introduced into the interior of the frames under a low head. This causes the cakes to drop off clean, into the pointed bottom of the filter-box, whence they are finally removed by sluicing. The whole operation requires about 3½ hours, and about nine tons (dry) slime are treated at each charge. The plant, therefore, has a capacity of about 63 tons per day. It is operated by one man on each shift. The principal power required is for pumping the pulp and the various solutions in and out of the filter-box, and for operating the vacuum pump. In addition, the gold-bearing solution discharged from the vacuum pump is raised about 30 ft. and forced through the discarded filter-press now used for clarifying purposes. The whole consumes about 10 h.p. A 15-h.p. motor has been installed for this work, but has extra work to do not connected immediately with filtering.

The filter-plant has required no repairs since it was first operated in February of this year, and has worked in the most satisfactory manner. The cost of filtering (exclusive of power) has been reduced from 96c. per ton of slime in January (using filter-press) to 26c. in May (using the Butters system). The power consumption appears to be about the same in the two processes.

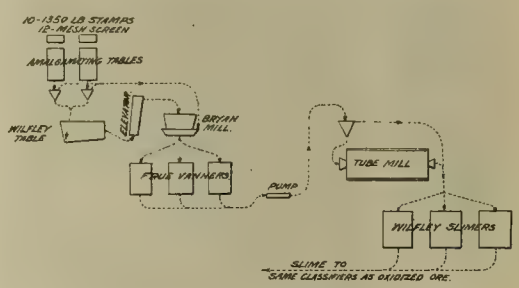


Fig. 4.—Treatment of Sulphide Ore.

Treatment of Sulphide Ore.—This ore is crushed to 12 mesh in two 5-stamp batteries, and run over plates to take up the small quantity of free gold present. See Fig. 4. A classifier at the end of the plate-tray removes the coarse sand and sulphide, which go to a Wilfley concentrator; the overflow of slime and fine sand passing to the outer lip of a Bryan mill. One Wilfley table, therefore, removes the coarse sulphide from the product of ten stamps crushing to 12 mesh. The tailing from the Wilfley is raised in a bucket-elevator to a Bryan mill, which crushes it to 40 mesh (No. 9 slotted screen). The tailing from the Bryan mill joins the stream of slime from the small classifier and passes to four 6-ft. Frue vanners. Here a large quantity of fine sulphide is removed. The Frue tailing is then elevated by a sand-pump to a classifier above a 4 by 12 ft. Abbé tube-mill of the trunnion type. The cone acts as a classifier as well as a de-watering device. The coarse sand passes to the tube-mill; the slime overflow joins the tailing from the tube-mill and goes to three Wilfley slime-tables of the latest pattern. The tailing from the last, consisting of slime and fine sand, is elevated to the cone-classifiers in the original mill, where it is mixed with the oxidized tailing and treated in the cyanide plant.

This plant was only operated a few days, and then shut down pending the installation of two Wilfley slime-tables, making three in all, the first having been set up experimentally. During this short run the results were very promising. Of the final product from the slime-table, 87% passed through 200 mesh, and the three stages of reduction showed a saving by concentration of over 80% of the contained gold. With the cyanide treatment of the slime tailing, a confirmation of the small mill-run is expected—namely, better than 90% recovery.

It is too soon to give the results of tube-mill work. The

mill is lined with 2½-in. silex blocks, which will be replaced by blocks 4 in. thick.

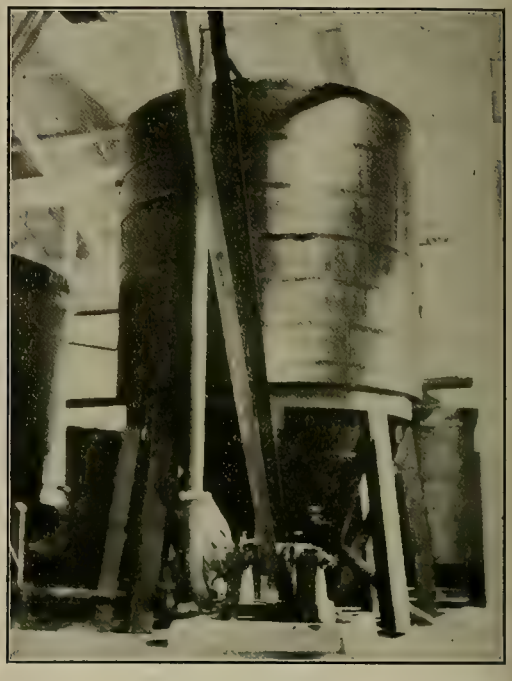
Precipitation is accomplished in the usual way by means of zinc shaving. The solutions are richer than are usually seen in cyanide mills, reaching as high as one ounce per ton in gold. Owing to the absence of silver, which undoubtedly facilitates the precipitation of gold, a very large zinc surface is required. The precipitate is refined with sulphuric acid and smelted in a pot-furnace, with gasoline, a powerful jet being maintained by means of a small upright Leyner compressor.

The following details of costs for milling and cyaniding indicate a few of the difficulties met with in an isolated district where the cost of supplies, and of labor, power, and water are unusually high. And then it must be borne in mind that the mill is of small capacity. The change from steam to electric power—the latter being furnished by a local concern operating a 90-mile transmission line—reduced the cost of power from a maximum of $1.73 per ton (January, 1906) to $0.76 (May, 1906). We have already noted the great reduction in cost effected by introducing a new filtering system for slime. The marked decrease in operating expense during February was due to increasing the capacity of the mill by annexing ten stamps, making twenty in all. While the total milling and cyaniding cost of $5.828 per ton seems high, it is really not so when local conditions are considered. It is expected that further retrenchment will soon cut this down to $5 per ton.

The recovery in the mill and cyanide plant has attained a maximum of 93% for several consecutive months, and has averaged over 90 per cent.



Tube-Mill and Wilfley Slime-Tables.



Slime-Agitation Vat.

CYANIDING COST PER TON OF ORE MILLED (1906).

Month.	LABOR.							SUPPLIES.								
	Ore tons.	Solution men.	Filter press.	Shovelers.	Tailing dam.	Butters slime filter.	Total labor.	Cyanide.	Zinc.	Acid.	Lime.	Filter cloths.	Other chemicals.	Miscellaneous.	Total supplies.	Total costs.
January	791.6	0.581	0.952	0.522	.....	.....	$2.055	0.362	0.121	0.031	0.155	0.016	.....	.....	0.685	$2.740
February	1,049.0	0.400	0.351	0.357	0.044	0.149	1.301	0.349	0.073	0.020	0.155	0.023	0.027	0.008	0.654	1.955
March	1,617.0	0.288	.....	0.426	0.068	0.230	1.012	0.181	0.052	0.017	0.115	.....	0.026	0.023	0.412	1.424
April	1,606.5	0.280	.....	0.449	0.060	0.255	1.044	0.311	0.058	0.033	0.167	.....	.....	0.017	0.576	1.620
May	1,842.5	0.254	.....	0.252	0.063	0.269	0.838	0.384	0.153	0.013	0.311	.....	0.005	0.004	0.870	1.700

NOTE.—The average consumption of chemicals in treatment of sand and slime during 1906 has been as follows: Cyanide, 1.27 lb.; zinc, 0.6 lb.; and lime, 11 pounds.

MILLING AND CYANIDING COSTS PER TON OF ORE MILLED (1906).

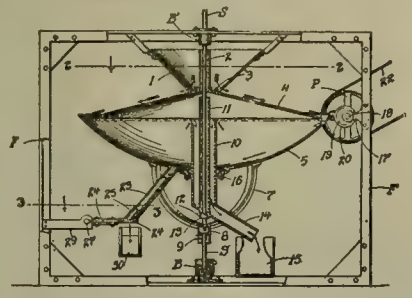
Date.	Ore tons.	Mill superintendent.	Power.	Heating.	Water and pumping.	Crushing and elevating.	Stamping and amalgamating.		Concentrating.	Cyaniding.		Assaying and sampling.		Lubricating.	Tools.	Lighting.	Maintenance and repairs.		General expense.	Total per ton.		Total costs.
							Labor.	Supplies.		Labor.	Supplies.	Labor.	Supplies.				Labor.	Supplies.		Labor.	Supplies.	
January	791.6	0.303	1.734	0.795	1.263	0.303	0.592	0.241	0.597	2.055	0.685	0.378	0.003	0.097	0.090	0.009	0.442	0.679	0.002	$4.670	$5.598	$10.268
February	1,049.0	0.214	1.193	0.194	0.953	0.221	0.401	0.345	0.409	1.301	0.655	0.287	0.009	0.035	0.035	0.010	0.278	0.275	0.002	3.111	3.706	6.817
March	1,617.0	0.151	1.311	.....	0.618	0.294	0.335	0.227	0.310	1.012	0.412	0.268	0.005	0.035	0.012	0.047	0.849	0.998	0.136	3.385	3.536	6.921
April	1,606.5	0.125	0.875	.....	0.622	0.291	0.377	0.139	0.317	1.044	0.576	0.332	0.012	0.040	0.020	0.027	0.753	1.520	0.152	3.351	3.871	7.222
May	1,842.5	0.130	0.763	.....	0.271	0.271	0.327	0.399	0.283	0.858	0.870	0.312	0.004	0.026	0.036	.....	0.782	0.420	0.068	3.022	2.806	5.828

MINING AND METALLURGICAL PATENTS.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

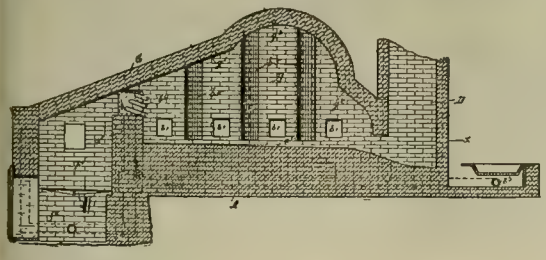
ORE-CONCENTRATOR.—No. 829,443; Walter R. Thurston, Douglas, Arizona.

A concentrator comprising a stationary hopper having discharge-openings, a distributer below the hopper for conducting the material discharged from the hopper, an oscillating disk-shaped or concave pan below the distributer for receiving the material from the distributer at points adjacent to the outer edge of the pan, an overflow-pipe for the waste having an inner sleeve passed centrally through the pan, and adjustable vertically within the pan, a stuffing-box on the pan through which the pipe passes, a central shaft for supporting the pan and overflow-pipe, means for oscillating the pan and overflow-pipe about the axis of the shaft, a spout leading from the overflow-pipe, and a valve-controlled discharge-spout leading from the pan at a point exterior, but contiguous to, the overflow-pipe, for the discharge of the concentrate.



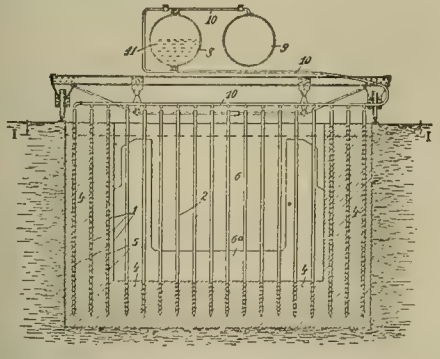
METALLURGICAL FURNACE.—No. 829,671; George W. Shear, Joliet, Illinois.

A furnace having its roof formed in part with straight, oppositely-inclined portions, the inclination of one portion being greater than the other, and also formed with a rampant arch, the lines of said arch merging with the lines of the straight portions, and the inclination of the arch being toward the front of the furnace.



PROCESS OF SOLIDIFYING EARTHY GROUND.—No. 829,664; Herman Mehner, Friedenau, near Berlin, Germany.

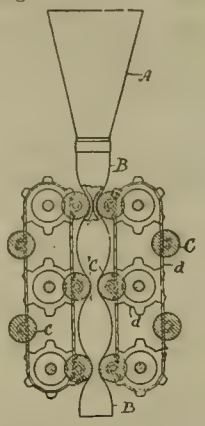
Process of solidifying earthy ground consisting in providing means at the borders of the ground portion which it is intended to solidify, adapted to carry away heat from the



said ground portion and introducing into the ground which is to be solidified a mineral substance in liquid condition adapted to become solid on cooling.

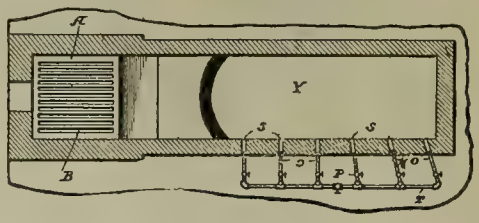
DEVICE FOR REMOVING ORE-SLIMES FROM SETTLING-TANKS.—No. 829,516; Henry Earle, Denver, Colorado.

In a device for removing ore-slimes from settling-tanks, the combination with the settling-tank of a flexible tube connected with the discharge-pipe, one or more pairs of rollers for grasping and compressing said tube and means for moving said rollers downward and returning them to the point of beginning.



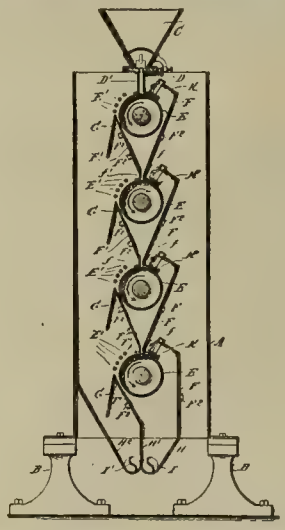
ROASTING FURNACE.—No. 827,226; Herbert W. Fox, Colorado Springs, Colorado.

The combination with the furnace having metallic portions, and rabble-shafts passing through the same and a chamber *X*, of a fireplace at the side thereof, a flue leading from the fireplace to the top of the furnace, and injectors arranged to project jets of air, or air and steam transversely of the said flue.



ELECTROSTATIC SEPARATOR.—No. 827,770; Millard Woodsome, Boston, Massachusetts.

In an electrostatic separator, combination of a repelling-electrode, means to feed material thereto, an opposed electrode, electrical exciting mechanism and connections therefrom to the electrodes, and an electrically-conducting shield surrounding portions of the repelling-electrode which are



not in immediate opposition to the opposed electrode, said shield being electrically connected with the exciting apparatus in parallel with the repelling-electrode.

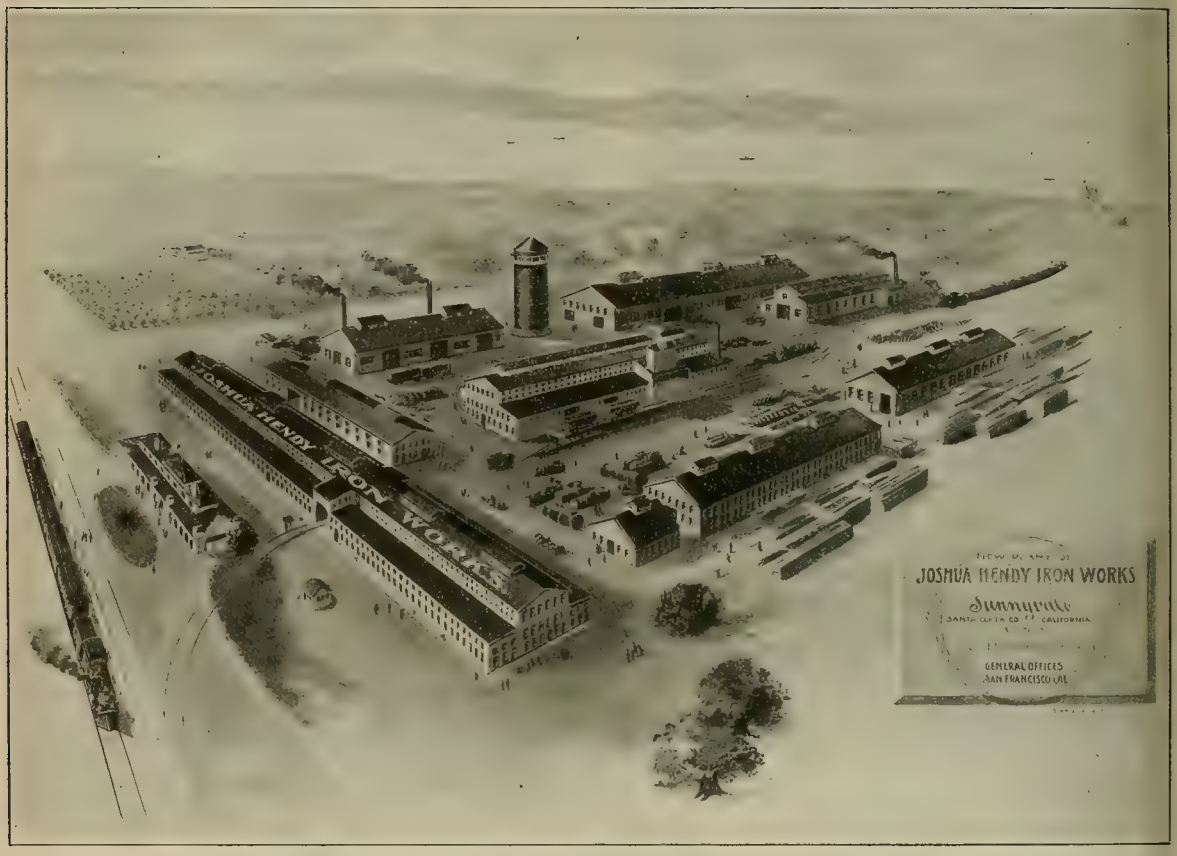
An Old Firm in New Quarters.

On September 11, the Joshua Hendy Machine Works, after having been incorporated since 1882, was merged into a new corporation, known as Joshua Hendy Iron Works. Articles of incorporation were filed on that day, the subscribers all being the present directors of the Joshua Hendy Machine Works; therefore the old company, despite the disaster of April 18, 1906, finds itself with an increased capital stock of $1,000,000 wherewith to continue its business operations. On the old site at 75 Fremont St., there is being erected a two-story building, 91½ by 137½ ft., a permanent structure to house the offices and salesrooms. This will be the first permanent building erected in that part of the burned district.

The temporary offices and shops on the old site at Bay, Kearny, and Francisco St., is to be abandoned on December 1. The manufacture of machinery will proceed in the new works nearing completion at Sunnyvale, in Santa Clara county. The company recently acquired a large tract of land at a place formerly known to old Californians as Murphy's Station, now called Sunnyvale, about ten miles north of San Jose on the coast line of the Southern Pacific railroad.

The accompanying illustration is taken from the architect's drawings of the proposed plant. There has been some delay in securing material for the completion of these works, but this obstacle has been overcome and the work is rapidly nearing completion.

The machine-shop is 420 ft. long and 80 ft. wide. Two 50-ton Niles traveling cranes, electrically operated, will handle the machinery in this department. The foundry building is 300 ft. long and 60 ft. wide, with a daily cupola capacity of 30 tons. The blacksmith-shop and boiler-shop exceed 200 ft. in length and are about 50 ft. wide; the pattern storage building is a two-story brick structure of fireproof construction; nearly adjoining it are the carpenter and pattern shops; the offices or administration building has been modeled after one of the station houses used by the Santa Fe railway along its San Joaquin division, and is constructed of re-enforced concrete, two stories high, 120 ft. long, and 40 ft. wide, the upper story of which will be used to house the engineering and drafting departments of the company. The buildings are arranged in a quadrangle. The machinery is all new, the previous equipment of the company having been totally destroyed in the fire; every machine will be operated directly and independently by electricity. It is estimated that the buildings will cover about ten acres, thus giving the community another large machine-manufacturing plant on this Coast, and one of the largest devoted exclusively to the manufacture of mining machinery.



The Joshua Hendy Iron Works.

Trade Treatises.

THE HENDRIE & BOLTHOFF MANUFACTURING & SUPPLY CO., of Denver, Colo., has issued a pamphlet describing the Jelinek cage-chair, a cage equipment increasing the speed and safety of hoisting through shafts.

THE WESTINGHOUSE ELECTRIC CO. has issued a finely illustrated pamplet, descriptive of the lighting of various large public buildings, by means of the newest lamp.

THE BLAISDELL CO., of Los Angeles, Cal., sends a well illustrated booklet describing the system of automatic cyaniding machinery for which this company has won a deserved reputation.

THE SCIENTIFIC INSTRUMENT CO., LTD., Cambridge, England, has issued a comprehensive publication (List No. 39), on technical methods of heat measurement. The work is entitled 'Technical Thermometry.' It describes numerous instruments for measuring heat and heat radiation.

ALLIS-CHALMERS CO., Chicago, Ill., issues an interesting illustrated Catalogue No. 17, on mining and quarry cars, skips, and buckets. Catalogue No. 10 describes Huntington mills and the methods of assembling them. Bulletin No. 1507, besides detailing Allis-Chalmers air-compressors, gives interesting notes on the theory of compression.

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Editorial.

THE ARTICLE on the Salton Sink under the title of 'A New Inland Sea' will prove interesting to those who have taken note of the vagaries of the Colorado river. The relief map of the Reclamation Service tells its own story well. In the current issue of *Out West*, there is an excellent article on the same subject by Mr. Sharlot M. Hall, which describes the agricultural conquest of the desert that is traversed by the Rio Colorado.

THE VICTORIA QUARTZ mine at Bendigo is down 4,300 feet, and much interest is taken in Australia in the ventilation of the bottom workings. Despite the fact that the water issuing from the rock has a temperature of 115° F., the air at the bottom of the shaft registers 86° only. Owing to the close vicinity of other deep shafts and communicating workings, it has been possible to establish an excellent system of natural ventilation.

TWO BIG PROBLEMS before the manufacturers of steel are how to prevent corrosion of structural material and failure of rails when in service. It has become evident that it is the maker of the steel, and not the manufacturer of the paint that protects its exterior, to whom the engineer must look for such improvement as will prolong the life of the material he uses. So many comparatively rare earths have been found to toughen steel and to give it better resisting qualities that it does not seem too much to hope that the addition of one of these may increase its ability to withstand corrosion.

JUST AT the time when the national ownership of railroads is being discussed in the United States, the Americanization or competitive joint-stock ownership of the railways of South Africa is being advocated in the Transvaal. The State-owned railways of that great gold-mining region are considered as giving a most unsatisfactory service with exhorbitant rates. One man's food is evidently another's poison. In South Africa the effort to earn profits from railroads that traverse a sparsely populated country, the industrial growth of which has not progressed far, necessitates high rates of transport, against which the mining communities have protested under the Boer regime and under British rule.

COPPER is selling for over 20 cents per pound. What this means to those mines which have generous lodes and economical management can be gauged by the fact that at the Wolverine mine during the last financial year it cost 6½ cents per pound to mine, mill, and market the copper produced. The Calumet & Hecla produces its copper for a cost of 8 cents per pound, and there are several mines, managed skillfully and operated on a large scale, that work for less than 10 cents per pound. Two years ago conservative estimates of future profit were based on an

average price of 13 cents; a mine that made any sort of profit then is in bonanza now. With copper above 20 cents, lead at 5.75, spelter at 6.06 cents per pound, and silver at 69 cents per ounce, the metal market presents an aspect encouraging to the miner. Civilization moves forward on iron rails and over steel bridges, it is sheathed in copper and adorned with silver, it needs spelter for its melting moments and lead to preserve its gravity, it talks either over copper or aluminum and its hard heart is gold; it needs the metals in every department of its multifarious activities. The age of wood and stone in construction and engineering is passing with the horse-car and the sailing ship. There is an increasing demand for the ore that comes from a hole in the ground, and there is a place for all the metal that the miner produces.

Reports on Mines.

Our contemporary at New York recently published some sensible remarks on reports of mine examinations, and, in the main, we agree with the tenor of them. To one suggestion we demur, and that is the idea of a decadence in the character of such documents. Of course, there are many reports that fail of their purpose, which is to convey the information necessary for the valuation of a mine, but, on the whole, as we remember the character of the stuff that passed current twenty years ago, we feel inclined to emphasize the great progress made in this branch of engineering practice. For it is an essential part of the engineer's work. What is the use of careful investigation, accurate measurement, and logical reasoning if the result of it all cannot be expressed clearly, to the end that the information can be conveyed from the intelligence of one man to that of another in the furtherance of business? There has been a notable advance in this respect. The time was when a report made by a representative mining engineer would include a general description of the mine and its environment, a story of its life, a record of its production, a few maps and the results of assays made on a scattering of grab samples or specimens; this being followed by estimates based wholly on the assumption that the ore in the mine was as good as that which had come out of it, and that therefore the yield during the future could either be maintained or doubled at will by enlarging the reduction works. Today the humor of such reporting would be recognized; it would never be taken seriously. It is true, the offices of exploration companies and similar organizations engaged in legitimate mine promotion are inundated with a mass of reports, most of which are open to criticism on account of their wordiness, incompleteness, or obscurity. But this is due, not so much to the general decadence or essential insufficiency of mine reporting, as to the multitude of men who perform such work nowadays. The number of men capable of appraising a mine has been multiplied immensely by reason of the spread of education and the facility for gaining experience; the financial activity directed to mining enterprises is twenty times greater than it was twenty years ago, and the variety of people engaged has grown in proportion. Formerly only educated engineers wrote reports; nowadays all sorts and conditions of men are allowed to have their say: Prospectors, geologists, metallurgists, and promoters, as to whom one can say that each has his function in the mining economy, but the appraisal of a mine is not the particular one for which they have been trained. Yet any one of them may by experience, sometimes at the expense of clients, become particularly well qualified for the work. A few prospectors possess an instinct tempered by judgment, so that their opinion is worth money; a few geologists learn enough about mine sampling to check their constructive imagination; a few metallurgists have added thorough knowledge of mining to their own special training; and of the promoters we find two classes, those who have graduated from mining into finance, and those who —to aid their finance—have taken pains to learn something about mining. From each of these classes of men there is recruited a number of energetic nomads who write reports, and it is but fair to say that the average of them comes nearer to the essential facts than did the clumsy document prepared by the mining engineer of an earlier day. Therefore we take a cheerful view; we believe that the first-rate mining engineer of today, by reason of the improvement of method due to world-wide industry and intense competition, does incomparably better work than those of aforetime, and that after him the irregulars, the volunteers, and even the camp followers do as well as the academic regulars of a day when the mining horizon was narrow and the industry provincial.

Patents.

Anyone scanning the Official Gazette of the United States Patent Office will find much interesting information, which is not quite submerged beneath queer spelling and rudimentary grammar. This record of the inventive minds of the country is eloquent of the multifarious channels into which its energies are directed. Apparently drinking is an important function of our people, for the non-refillable bottle is the elusive goal of so many ingenious people and next to it comes its complement the bottle-stopper. The importance of railroad operations is reflected on the pages of the Gazette, for nut-locks, automatic switches, car-couplings, and signaling apparatus are invented every month. The farmer is in the mind of the inventors who take out patents for disc-harrows and self-closing gates. While the art of printing and the multiplication of writings has progressed rapidly, there is hope of further advance, for printing devices and typewriting machines are commonly found among the new patents. Toys bespeak a love for the little ones and it is satisfactory to observe that the amusement of children should be regarded as a profitable business. Finally, the childlike in man is expressed in the many garment supporters, clothes-presses, and hat-hangers which are designed each month. It argues at least a regard for neatness, to which cleanliness is allied, and a growth of taste in one of the small, but salient features, of the manner of living usually termed civilization.

By the Way.

In an address delivered by Mr. Walter C. Kerr to the graduating class at the Staten Island Academy, he said: The only objection I have to commencements, whether of academies or colleges, is the intimation that they are the end of education and the beginning of the world. Education is a continuous performance, the first acts of which are within halls where systematic guiding gives direction and method to personal endeavor. One reason why many who have had much schooling are poorly educated is that they stopped learning, and by a strange anomaly they seemed to stop at commencement.

The education you get through books and teachers is elementary. That which you gain yourself may be profound. Profundity is wholly a matter of quality, not quantity. The world is too full of a number of things, and you will find more tendency to scatter than to concentrate. It is therefore well to do whatever you do with all your might and regard nothing as too small to be done the best you know how. Cleverness will not accomplish much. Brilliancy only serves to permanently polish good things and temporarily polish bad ones. Grace and culture lend charm to anything, but none of these things make for progress. Advancement only comes through good, hard work, diligent application, faithful performance, correctness, accuracy, and that fine display of judgment which flows only from a well ordered mind, capable of thinking independently, acting resolutely, and fearing nothing.

At this commencement time it is well to commence to forget the standards set by the completion of printed pages and the measure fixed by examinations. The world's problems do not come systematically and in the preferred order of easy ones first, followed by a gradation to the most difficult. They come by chance and they hit you sidewise, endwise, and with all degrees of percussion. You must meet them, solve them, get good out of them, and utilize them as the means to further achievement.

Some persons devote much time to passing opinions, stating what they think. It does not make much difference what you think about things. It is what you do about them. There is even danger of thinking too much unless thought is intuitively coupled with action. Your thoughts may sometimes wander harmlessly, but your acts need be right all the time. If you can now begin with the elementary education you have received in a good academy, or even the more extended but still elementary education which some of you will receive in college, you can proceed to make your personality effective in doing those things which your natural tendencies lead you to best do. You will then, in the course of perhaps twenty or more years, become fairly educated as measured by the standard of human performance related to the average span of life.

Humanity is composed of all kinds of people possessing widely different temperaments, tastes, and abilities. It is well that they are not all alike. Anyone will achieve the greatest effectiveness through the opportunities and training which develop native powers. Any other training is liable to stunt the natural growth. Variation in progressive development should be in the direction in which one tends to vary. This assists in the survival of the fittest, the survival of the unlike, the survival of the effective.

Manifestly there must be as many kinds of education as there are types of people, and fortunately the number is not so great but that they can be readily supplied at least within our higher institutions. So long as education was confined to one channel, those whom the channel precisely fitted were greatly benefited; those whom the channel somewhat fitted were somewhat benefited; those to whom the channel was a misfit were injured because, during the formative period of their development, their native power to vary was resisted, their minds forced away from their natural trend, and energies which could have been potent for good in certain directions were dwarfed by the compulsory exertion of uninteresting, unproductive effort. This results in a kind of mediocrity which is stagnation. You can't make anything good of a man except to make him better in that which he is. You can't unmake him and make him over again.

If it be held that one must needs have the so-called liberal education in order to be well rounded, it is pertinent first to determine whether roundness is what is really wanted and the fitness of the subject to the end. We don't build walls of round stones. We hew them square —some are better rough hewn and others are better when polished. It is not well to attempt to take all the corners off humanity. They should be left on to dent something.

When it is observed that in our modern universities which offer to students wide ranges of educational courses, less than one-quarter follow classical pursuits when left to free choice and that over three-quarters elect professional and industrial education, there is good reason to believe that this is about the proportion in which minds are fitted to receive benefit from the acquirement of the respective classes of knowledge and training. I therefore maintain that instead of decadence in the humanities they are elevated by this natural selection because their representatives become only those whose minds are fitted to take such education and who will therefore conspicuously represent the best possibilities of classical training applied to those to whom it is adapted.

In addition to the several agreeable and desirable attributes of classical training, its fundamental benefit comes through the melting down and re-casting of thought, which to some minds is a stimulating and cultivating process. There are other processes of like kind and quality that are adapted to other minds, notably the melting down of the laws of nature and re-casting them as applied science. Another cultivating and most useful process, too little practiced, is the melting down of one's own thoughts and so re-casting them that they can be understood.

We have heard too much about knowledge for its own sake *versus* knowledge for use. All knowledge is for use. All education is for action. The engineer uses mechanics and thermo-dynamics in a certain direct way. The architect uses art and constructive knowledge in a similar way. The lawyer uses his knowledge in a less material way. The classical or philosophical man uses his acquirements in a different way, but if he does not use them they are useless. The older I grow the more I think there is no such thing as liberal education, liberal arts, or liberal anything, as distinct from specialized departments of knowledge. As to the so-called specialized courses, these are only names. They are no more special than the humanities. Some are scarcely so highly specialized. All education is liberal or all is technical, according to our definitions, but all is for use.

To youth this old world is always a new country. Pioneers must plunge in, turn over what to them is new soil, and make of it the best they can; always in the spirit of industry and honesty, with that aspiration for betterment which invariably turns for good that which is worthy and turns to naught that which is undesirable.

The fault and the fate of the rolling stone is not so much because it rolls as it is that it usually rolls down hill. When you move be sure of your direction.

Special Correspondence.

Johannesburg, Transvaal.

Less Crime Among the Chinese.—Better Police Supervision.—Reading Rooms for Miners.—Increased Gold Production.—The Premier Diamond Mine.

There has been a most acceptable diminution of Chinese crime along the Rand. One got so tired of picking up the morning paper and reading of 'Another Chinese Horror,' that it is quite a relief to find this head-line of yellow journalism missing from the daily paper. Every offence committed by a Chinaman has been magnified far more than if the wrong-doing were done by a Kaffir or white man. One feels sorry for the anti-Chinese brigade, whose chief topic of conversation—'Chinese outrages'—is being taken away from them. One reason for the improved state of things is the gradual re-patriation of the undesirable Chinese. The Protector of Chinese has the power under the ordinance to send back to China any coolie that is considered a dangerous character. Another reason is the improved police supervision, and more earnestness on the part of the authorities to make the punishment fit the crime. At one time a coolie had no objection to spending a month or two in jail; in fact, he looked upon his sojourn there as a holiday. But a coolie does not look forward to a month's residence in jail with much pleasure now. A very good scheme has been put into operation by the Foreign Labor Department. Periodically, they send out a Chinese notice to the mines, written in all the flowery language of the East, informing the coolies of those of their compatriots who are undergoing long imprisonment for serious crimes, and of those that have been hung for murder. These notices have an excellent influence in the compounds.

There has been considerable improvement on the mines in the way of provision of recreation for the men during the last few years. Spacious recreation clubs have been built at nearly every mine, where the men can spend their spare time, instead of sitting in cheerless rooms. In each club-house there is a large billiard room, with two or more tables. There is also a large assembly hall, with a fine stage, where theatricals and concerts can be held. Each mine has a library and reading room, and efforts are being made to induce the men to read technical literature, and pay less attention to books, of the 'blood and thunder' type. The employees of the company are charged from $0.75 to $1 per month subscription to the club. Billiards cost the men less than half what is charged at the bars in the neighborhood. It is difficult to decide exactly how much a hall saves the company, but the indirect advantage is very great. On some mines the improvement in sobriety has been marked. The men do not run away from the mines at week ends, but remain on the properties and spend their time at the club. Altogether the introduction of these halls has proved a great success.

The results for August are not yet published, but there seems to be little doubt but that another record will be established. It is satisfactory to note that the struggling companies, like the New Unified, which were recording losses a few months ago, are now earning fair profits; in fact, there is scarcely a producing mine on the Rand that is not making a small profit. This speaks volumes for the great gold deposit, which is being worked for a distance along the strike of more than 60 miles.

There has been some comment upon the drop in grade at the Premier diamond mine. In January 1905 the returns were 0.77 carat per load, while for August 1906 it was only 0.25 carat per load. The scale of operations has increased from 99,933 loads washed in January 1905, to 411,707 loads washed in August 1906. In spite of the fall in grade, the Premier is still the greatest diamond mine in the world.

Joplin, Missouri.

The Weekly Returns. — Record Output Expected for 1906. — New Companies Organized.—Important Discoveries Made by Drilling.

The highest price reported for zinc ore last week was $47 per ton, one carload selling at that price from the Missouri Lead & Zinc Co.'s land. Lead ore remains steady at $82.50 per ton and shows much firmness. The shipment of zinc ore from this district shows an increase of 653,380 lb. over the previous week, and 1,964,840 lb. more than the same week last year. The lead ore shipment was 290,480 lb. less than the previous week, but 651,680 lb. more than the same week last year, and the value was greater last week than that of the previous week by $1,090, and more than the same week last year by $59,103. Zinc ore sold a year ago at $55 per ton and lead ore at $63.50 per ton. The ore shipments for the week were: Zinc ore, 11,600,560 lb., valued at $242,660; lead ore, 1,771,430 lb., valued at $70,523; combined value, $313,183. The shipments for the 39 weeks of this year are: Zinc ore, 413,515,660 lb., valued at $8,956,394; lead ore, 58,298,650 lb., valued at $2,233,320; combined value, $11,189,714. The shipments for the same period last year were: Zinc ore, 376,387,780 lb., valued at $8,425,585; lead ore, 46,371,350 lb., valued at $1,358,540; combined value, $9,784,125. Should the weather remain favorable for the next three months the value for the year 1906 should reach the $15,000,000 mark, making it the best year in the history of this mining district.

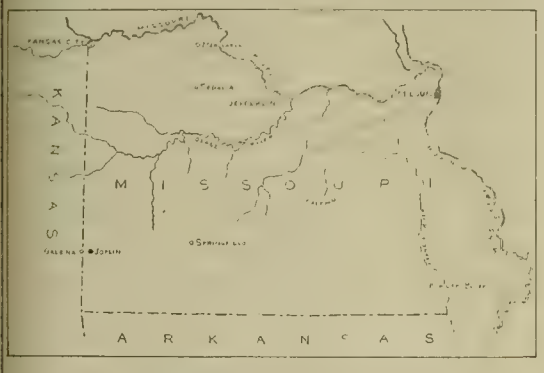
Articles of association have been filed by the Rhea Lead & Zinc Co., with 350 shares of the value of $100 each, all paid up for a term of 20 years.——The Overland Lead & Zinc Co., of Webb City, has been organized, with 120 shares of the value of $250 each, all paid up for a term of 50 years. —— A company composed of Jess Harrison, Wm. McAboy, W. N. Johnson, Jerry Clark, and George Booth, all of Webb City, made a rich drill-strike in Newton county, two miles west of Diamond, recently, encountering the ore at 65 ft., and they are still in it at 110 ft. The drillings show this to be one of the best strikes made in that locality. Other holes will be put down and the land thoroughly tested.

The Little Pearl Mining Co., under the management of T. C. Malloy, which has a lease on 14 lots on the Continental tract, promises to open up one of the best mining propositions in this part of the district. In a drill-hole now being put down near the centre of the lease, the company has encountered what is thought to be the richest run of ore ever found on the Continental tract. At a depth of 50 ft. a run of lead ore was found and continued down to 70 ft. At the 85-ft. level zinc ore was found and continued down to 165 ft. At this depth the drill-tools became fastened, but as soon as they can be loosened the hole will be put down to a depth of 200 ft., where the run of sheet ore now being worked by neighboring companies ought to be found. A shaft is being sunk near the drill-hole and is now down 20 ft. In a shaft a couple of hundred feet east of this last drill-strike, two good faces of ore have been opened up at the 145-ft. level. A new 200-ton concentrating plant is to be built. More drilling will be done on the lease to thoroughly test the land. —— William Houk, who recently opened up a splendid mine on the Granby Mining & Smelting Co.'s land at Smelter hill, now has the property in shape for making regular returns. After taking the lease on this tract and before commencing permanent development work, Mr. Houk put down 27 drill-holes, good runs of both lead and zinc ores being found in 22 of them.

London.

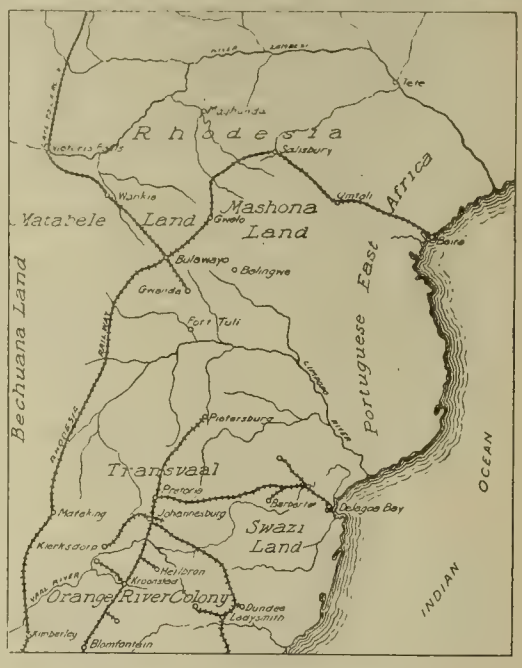
South Crofty Meeting. — East Pool Yields Profits.—Cornish Consolidated Tin Mines Acquire Lease in Botallack District. — Great Cobar Monthly Profit Exceeds £15,000. — Scheme to Develop Enormous Hematite Deposits of New Zealand. — Changes at Dolores. — El Oro Annual Report.

At the first (statutory) meeting of the shareholders of South Crofty, Ltd., held two weeks ago at Camborne, particulars of progress under the new company were given. The actual management was taken over about the beginning of August, and it early appeared that attention would have to be concentrated upon the prompt completion of Robinson's shaft. Until that shaft was equipped and completed economical working could not well be introduced. Up to the present they were at the 170-fm. level. They had a station at the 60-fm. level for a balance box, a cistern plat had been cut at the 170-fm. level, and a tram-road also had been made. A good deal of dead work naturally had to be carried out in removing more than 700 tons of rock. The pit work in itself was only carried to the 36-fm. level below the adit, and now it had to be completed to the 170. The tenders for the necessary pit work were out, and the work itself should be delivered at the end of October; but the timbering and pit work made a heavy job, and would take some time to do. In the meantime, from the bottom of the shaft they had brought to the surface



Sketch Map Showing Position of Joplin.

six tons of ore from a lode six feet wide, and those six tons carried 37 lb. mineral per ton, which was exceedingly satisfactory. At present their ore carried a little over 7% wolfram, and their intention was to eliminate that wolfram and send clean tin to the market, so that it would fetch as good a price as that of anybody else. The price of the magnetic separator was already settled, and the machine would be delivered in five weeks. At the present moment they had on the floors 35 tons of tin from the stopes, and they had only been using 32 heads of stamps out of the 60, the remaining 28 having been pulled out to be replaced by more modern stamps. When they took possession the mine was selling at the ticketing a little over eight tons per fortnight, and at that time they were employing 80 men in the stopes. Fifty-five men were wanted for the dead work, which only left 25 stoping. On the other hand, although they only had 32 heads of stamps running, they managed to keep up to three tons of tin per week, which nearly covered all the cost of mining and dead work, and they were drawing on their capital only to the extent of £100 per week. The intention with regard to the future was to deal with 100 tons per day, and the ultimate crushing capacity would be to the extent of 40 head of Californian stamps, with a weight of 1,050 lb. per head, and probably they would bring up the duty of each stamp to three tons per day. The ore that had gone to the stamps during the past month had yielded 40 lb. of mineral per ton, which spoke well for the mine. With regard to the royalties they had approached the landlord and the royalties had been reduced to one-twenty-fifth when black tin was over £80, and one-thirtieth when it was below that price, which might be considered very reasonable terms. C. Fred. Thomas, general manager, told the meeting that his first impression of the mine was distinctly a favorable one; but they had to deal with complex ore. For instance, at the 160-fm. level, west of Robinson's shaft, it was not an unusual thing to take up a stone in which could be easily distinguished tin, arsenic, wolfram, and copper. The statement of accounts of the East Pool and Agar United mines, adjoining South Crofty, shows a profit of £4,368 on East Pool section, and a loss of £24 on Agar, the profit being considerably less than for the preceding



Transvaal and Surrounding Country.

twelve weeks. The agents report that in the early part of the year the tribute pitches fell off in value, and have not yet recovered. They say that the cutting of the new South lode at the 170-fm. level is an important feature in connection with the mines, as it will add considerably to the output and life of the property. Development work has increased during the year, and will be still increased in the coming year. Tin stuff mined during the twelve weeks amounted to 13,454 tons (dry weight); levels, cross-cuts, winzes, and raises, 110 fm. 3 ft. 9 in. About £5,800 was received for by-products. The Cornish Consolidated Tin Mines, Ltd., says the *Western Daily Mercury*, has acquired a lease of Botallack, Carn North, and Buzza, adjoining setts, and intend to work the three as one concern. Buzza was formerly a part of Wheal Owles, but is distinct from the part holed into Boscean thirteen years ago, when several men were drowned. The company named, of which F. Allen is chairman, is already working Clitters, Ltd., and has a large interest in South Crofty. When Botallack ceased working, the miners had followed a rich lode a long way under the sea, and the intention of the new company is to work the lode vigorously. The mine will also be sunk deeper probably by means of a new perpendicular shaft. Nothing has been done below the 200 level, while the adjoining Levant mine, a steady producer, is down 360 fathoms.

Botallack has first to be unwatered, but a portion of the scheme provides for this. All the money necessary has been guaranteed, and the public will be shortly given the opportunity of subscribing a portion. The mine ceased operations in 1895. In the last five years' working there were sold 376 tons of tin per year, at an average price of £49 per ton. The working costs were £54 per ton, and the loss about £9,000. If the same quantity of tin were sold each year at the present price, and the working costs per ton were the same, there would be a profit of £90,000 in five years. W. Thomas, for over 20 years instructor in mining at the Camborne School of Mines, who is now in charge of King Edward, the model mine run by the school, has been appointed manager of Botallack, and will commence his duties next month. The average price per ton of black tin sold at the last Cornish ticketing was £106 8s. — nearly £1 in advance of the previous price; 228½ tons (an appreciable increase on the previous sale) were sold for £24,312 11s. 3d. Dolcoath headed the list, of course, with 65 tons, but the best average price was obtained by Clitters. A correspondent remarks that when the present Dolcoath company started, in 1895, the produce per ton of ore was 79.19 lb. Today it is 41.28 lb., so that hundreds of tons more of stuff have to be taken to the stamps and treated throughout the dressing floors to get the same amount of black tin. It is therefore found that, whereas 28,717 tons of tin ore crushed in the first half-year of the Dolcoath company's operations produced 1,015 tons of black tin, 21,217 more tons of stuff were crushed during the first half of 1906 to produce 95 tons less of black tin. To the splendid price of tin this year must be attributed much of the success now being achieved by the Cornish mines. Dolcoath received on an average £39 3s. 5d. per ton for black tin during the opening half-year of the company's existence, and during the half-year ended June 30, £105 13s. 4d. Fortunately, R. Arthur Thomas has been able to lower the working costs, and there is every prospect of the percentage of produce increasing. Judging from local comments on the labor question it would appear that the hopes expressed at the commencement of the revival, that Cornishmen would return in big numbers from foreign fields, have not been realized, and the necessity for concerted action on the part of the executives grows greater every day. The results of the experiments made in London with the Mackillop high-speed stamps have excited some attention. It is stated that the push cam to accelerate the fall of the stamps was at work in Cornwall several years ago, but failed to get into general use. The entries at the Camborne School of Mines this year are reported to be largely in excess of those of last year at the same time; something like 18 more have entered than in September last year. The list comprises students from most of the large public schools.

Great Cobar, Ltd., has begun well as might have been expected from the favorable circumstances which attended its inception. According to a cable from the mine on the 11th of last month 12,200 tons of ore had been raised since August 22, and 11,300 tons had been smelted, the output of matte from which was 820 tons, the profit on that transaction being estimated at about £15,000. That is for 21 days. An enormous increase in this output is expected when once new machinery is set going. That the stock of this company is in capable hands may be judged from the present market price — £4.12.6 per share for the 750,000 £1 shares. Lloyd Copper, also a New South Wales venture, tells a less flattering tale. Formed in 1899 the company has not yet entered the dividend list, and the £1 shares are quoted at about 15s. A cable advises that, owing to exceptionally heavy rain, the roads are rendered impassable, thus necessitating the closing down of the production plant for a month. Mining, however, will be continued as usual. The developments in the mine are stated to be highly satisfactory, the lode in the No. 3 level east having widened out to six feet of high-grade ore. A profit of £5,000 is announced for September.

It is reported that J. H. Witheford, who for six years represented Auckland city in the New Zealand Parliament, is now in England in furtherance of a scheme to deal with what has been described by experts as a veritable mountain of hematite ore situated at Parapara, Golden Bay. According to a published statement engineers compute the visible quantity at from 100,000,000 to 600,000,000 tons, and analyses after smelting have proved very satisfactory. In the event of a company being formed to acquire the lease and work the ore with a capital of not less than £200,000 (£100,000 to be spent in acquiring lands, erecting buildings, and in providing the necessary plant), the New Zealand Government has promised a bonus of £1 per ton on the first 20,000 tons of marketable iron or steel produced.

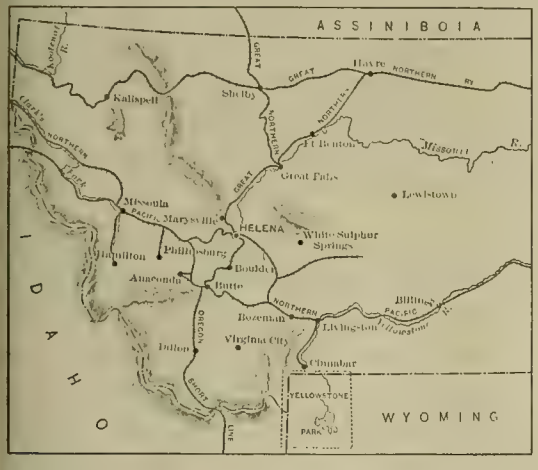
The gross receipts for the month of August from Dolores mine are reported as $34,500 and the profit $11,500 from 1,100 tons treated in the mill which broke down during the month. The damage has been already repaired. Notwithstanding this low return, it is generally believed that the critical point in the company's affairs is passed, and when once the initial difficulties connected with the milling, transport, and labor supply are surmounted, Dolores will rank as one of the most notable mines of the Republic. According to rumor, apparently on good authority, George A. Schroter, consulting engineer of the Venture Corporation, has been appointed consulting engineer of Dolores Mines Co., in place of John B. Farish and George J. McCarty, who have retired from the position. The report of El Oro Mining & Railway Co., Ltd., for the year ended June 30 last shows a profit of £204,756, to which is added £32,057 brought forward, making a total of £236,814. After making provision for the new 100-stamp mill, general improvements, other matters, and dividends of 2s. 6d. per share during the year, there remained a balance to carry forward of £58,129. A further £5,033 was expended upon the No. 2 mill, and that construction account is now closed. The erection of this mill, and the introduction of electrical power and of improved metallurgical appliances, have resulted in a substantial decrease in the working expenses and an increase in the percentage of precious metals extracted from the ore. The total average cost per ton, including all expenses in Mexico for the year 1906, was $5.73 (United States currency) per ton, compared with $6.87 for 1905; and the average gross value extracted from the ore in 1906 was 84.93%, compared with 73.80% for the year preceding. The replacement of steam by electrical power was commenced in February last, and is now practically completed. During the year 234,079 tons of ore were treated, of an average gross value of $11.28 per ton, of which $9.58 per ton was recovered. Although development in depth has been retarded owing to necessary repairs to the Somera shaft, good progress has been maintained in other parts of the mine. The development work for the year amounted to 8,870 lin. ft. Mr. Raymond estimates the ore blocked out and ready for extraction on June 30 at 605,205 tons, with average gold content of $8.35 per ton. The silver content is about three ounces in addition to the above. He states, however, that, besides this tonnage, there is a considerable amount of ore partially blocked out, which indicates an additional 200,000 tons. The seventh annual meeting of the stockholders held yesterday was a successful one, thanks in a great measure to the lucid and comprehensive statement of the chairman—R. T. Bayliss—concerning the position in Mexico and the com-

pany's interests in the Mexico mines of El Oro and Somera Gold Mining Co. The local management may be congratulated in the appreciative sentiments of the stockholders, who unanimously voted a bonus of £1,500 to R. M. Raymond for his exceptional services, and also one of £750 to his assistant manager—A. F. Main.

Butte, Montana.

London Exploration Buys Interest in Butte Coalition.—Montana Output for 1906 to Show Increase.—Activity in Minnie Healey and West Colusa Mines.—Clark to Sink on Elm Orlu Mine.—Scarcity of Labor Curtails Output.—Butte and Superior Preparing for Extensive Development of Blackrock Group.—Company Organized for New Copper District.

The Rothschilds, through the London Exploration Co., have purchased 50,000 shares of the Butte Coalition Co.'s stock, at $35. Philip L. Foster, of New York, the American representative of the London Exploration Co., spent several weeks in Butte examining the properties of the Butte Coalition Co., and on his report the Rothschilds made the purchase. Mr. Foster was in Butte at the time the division of the controverted orebodies was made between Coalition and Amalgamated and saw that Coalition was most generously treated, being granted practically all that Heinze, Coalition's predecessor, had contended for during



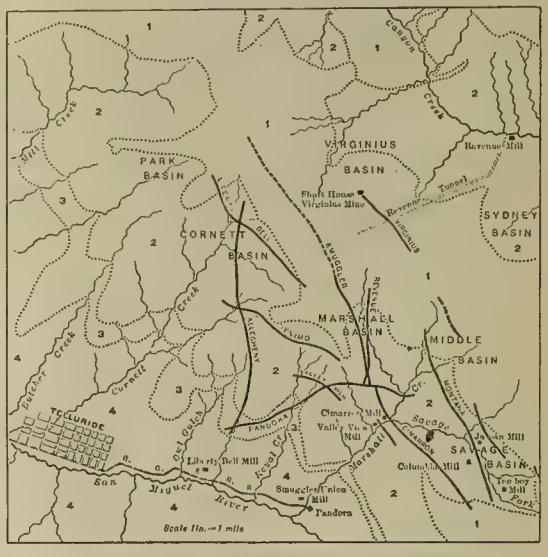
Montana.

his twelve years of litigation with Amalgamated. The stock purchase by the Rothschilds includes a large portion of the 30,000 shares of stock which the Guggenheim interests were some months ago trying to sell, which had been allotted to them at the time of the purchase of the Heinze interests by Coalition, the Guggenheims securing the stock at $15 per share. Arthur C. Carson, who had been a member of the Coalition board of directors and general manager of its mining operations, resigned as director, and Mr. Foster was elected in his place to represent the London people. The same people in 1895 bought one-third of the stock of the Anaconda Co., taking over at that time the stock of the Hearst interests. They have since been in close touch with Butte companies and have made several attempts to increase their Butte holdings. It is understood that they offered to buy a block of North Butte, but not enough stock to satisfy them could be got together.

Amalgamated representatives express the opinion that the Montana output of copper for 1906 will be about 5% greater than it was last year, while other operators place the estimate as high as 10%. All agree, however, that next year, with a continuance of present conditions, the increase over this year should be fully 25%. It is expected that East Butte will next year be among the steady producers, and that Butte Coalition will increase its output more than 50%, while North Butte will add about 10% to its output. Anaconda and Parrot should also present a better showing than this year.

Work has been resumed on the Minnie Healey mine of the Butte Coalition Co., which had been closed for a month or more on account of the bad condition of the shaft. One hundred and fifty feet have been re-timbered, and the company hopes to be able to use the shaft now until the new one, which is being sunk on the Tramway, is finished. The Minnie Healey shaft, however, is unsafe in other places, and it is not certain that it will not necessitate another shut-down. When the Tramway shaft is completed connections will be made with the Minnie Healey mine and the latter property worked through the new opening. The new shaft is being sunk by the Butte Coalition and Butte & Boston jointly, as the two companies are joint owners of the Tramway.

It is expected that the West Colusa mine of the Boston & Montana Co., will be in operation again this week, as the re-timbering of the shaft has been completed. The



Sketch Map of Telluride District, Colorado.

West Colusa shaft is 1,635 ft. deep, and as soon as regular work in the mine is resumed the shaft will also be sunk deeper, it being the intention of the company to put it to a depth of 2,000 ft. During September some ore, amounting to about 300 tons per day from this mine, was hoisted through the St. Lawrence shaft of the Anaconda Co. Ordinarily, when running full capacity, the West Colusa yields about 1,100 tons per day.

The shaft which is being put down by the Farrell and Alliance companies jointly, has reached a depth of 200 ft. and a station is being cut at that point. The first vein in the Alliance ground is only 25 ft. south of the shaft, and will be cross-cut in a short time. The same vein extends into the Farrell ground.

A hoisting engine capable of working to a depth of 1,500 ft., and two 100-h.p. boilers, are being placed on Clark's Elm Orlu mine, a property adjoining the mines of the Butte & Superior Copper Co. Senator Clark will sink a shaft 1,000 ft. deep on the Elm Orlu.

The East Butte Extension Co. is hoisting ore from four shafts on its properties and will soon be producing from the fifth, where development work is in progress. The company is also working the Arnold copper mine at

Rimini, Mont., and has made one shipment of ore assaying 30% copper.

The Boston & Montana Co., one of the Amalgamated sub-companies, is at present producing copper at the rate of 100,000,000 lb. per annum, but the improvements being made in the mines and enlargement of the smelter at Great Falls should add about 20,000,000 or 25,000,000 lb. to next year's output of copper. The main reason why the output this year in Montana will not come up to what was expected is the scarcity of labor that has prevailed during the past six months.

Preparations are under way to do extensive development work on the Blackrock group of mines which the Butte & Superior Copper Co. purchased from Senator Clark and associates. Lessees are working the upper levels of the mines and are shipping a lot of silver ore daily. The Butte & Superior Co. will, however, work it for copper, which is known to exist at greater depth. The shaft will be re-timbered from the surface to the 500-ft. level. It is expected that it will take 35 to 40 days to re-timber the shaft. By the time the work is completed the new hoist and machinery will be up and then the company will prosecute the work of sinking rapidly.

The Parrot Copper Co. is putting up equipment on the Little Mina, a property lying north of the Nipper, and will resume operations on it soon. The Little Mina has a shaft 800 ft. deep, and 200 ft. will be added to it.

The Amalgamated Co. has decided to develop and explore its coal beds on Bear creek. Several other companies have been operating there for many years and have opened good mines. The Amalgamated now has its experts there planning the work to be done.

The Ida-Montana Co. is putting in the foundation for a big hoisting plant on its property southeast of Butte, and in a short time sinking will be resumed.

The shaft being sunk jointly by the Farrell and Alliance companies, in the southeastern part of the city, cut into a good-sized vein of ore at a depth of 190 ft. It is the second vein cut by the shaft.

The Amazon-Butte Copper Co., which has started work on the surface to uncover one of the veins on the Amazon claim for the purpose of selecting a site for a shaft, has cut the apex of a copper-bearing vein. It is believed to be the same vein which has been opened in the Bullwhacker, Montgomery, Bertha, and other claims to the north of the Amazon.

F. Augustus Heinze, who has spent very little time in Montana since he sold his mining interests in the Butte Coalition Co., will continue to make Butte his headquarters. He has acquired control, for the United Copper, of a number of gold properties in Montana, lead mines in Idaho, and copper mines in Utah, the management of which will be under his personal direction.

The Park Copper Co., capitalized at 1,000,000 shares of $1, has been organized. The company owns a number of claims in a new copper district on the Wise river, about 50 miles south and west of Butte. It is reported that a vein 60 ft. wide has been opened on the surface for a distance of 2,000 ft., and that ore from a shaft on the vein 15 ft. deep assays 12% copper.

The Butte & Bacorn Co. is making good progress on several of its shafts, that on the Belinda having reached a depth of 450 ft., that of the Calumet 400 ft., and the Colleen Bawn 275 ft. The last named has for some time been in bad ground and has caused the company a lot of trouble. The company expects to run cross-cuts from the shafts at a depth of 500 feet.

In the Butte & London shaft, being sunk on the Greendale placer, a copper-bearing lode has been cut at a depth of about 650 ft., indicating the presence of veins in the ground. The shaft will be put down to a depth of 1,200 ft. before any cross-cutting will be done.

Toronto, Canada.

Stock Market is Active in Cobalt. — Chicago Syndicate Buys Interests in the Tretheway Mines. — The Watt Property Sold to a Canadian-American Syndicate. — New Vein Discovered on the Right of Way Company Mines. — Silver Queen is Producing Steadily.

American capitalists continue to make heavy investments in Cobalt mining properties, some important deals having been closed during the last few days, while many others are pending. The stock market is active, with shares in the mines of proved value advancing by leaps and bounds, especially in cases where a change of control and the introduction of new capital and improved methods give promise of rapid development and increased output.

The most noteworthy transaction is the sale of G. W. Tretheway's interests in the Tretheway mines to a Chicago syndicate, the personel of which has not transpired. The properties affected are those of the Tretheway Silver-Cobalt Co., originally known as J. B. 7, and of the Coniagnus Mining Co. (J. B. 6) immediately adjoining, each being 40 acres in extent. The price paid is said to be about $600,000. Toronto and other parties had been negotiating for the purchase of the controlling interest in the Tretheway Silver-Cobalt Co., and when the conclusion of the deal with the Chicago men was announced, injunctions were issued against Tretheway on behalf of W. G. Fox, a Toronto broker, and C. J. McCuaig, of Montreal, both of whom claimed that Tretheway had agreed to sell to them, and asked that he be restrained from parting with the shares. These proceedings, however, were too late, as the formal transfer had been effected. As big figures are specified in the papers there is a shrewd suspicion on the part of some that the injunction proceedings may have been undertaken to boom the stock.

The Watt property, adjoining the McLeod-Glendinning, Rothschild, Nova Scotia, and other noted mines, has been bought by a Canadian-American syndicate, represented by Frank L. Culver. A carload of ore, shipped by the late owners, proved of good quality, and another is awaiting shipment. Modern machinery will at once be introduced by the new management.

The Right of Way Co. has fifteen men at work and five veins have been traced. Veins No. 1 and 2 are directly opposite La Rose mine, and were for some time in dispute between the mine-owners and the Provincial Government, the courts deciding in favor of the latter. Twenty feet below these a new vein has been discovered, and followed for 75 ft. It is a calcite vein, carrying much free silver. Vein No. 1 is on the portion of Cobalt townsite included in the company's holdings, and No. 5 is a continuation of a rich vein on the Silver Queen.

At the Silver Queen driving has been carried on at the 65-ft. level for about 100 ft., and much rich ore taken out. The vein here is about 18 in. wide. A large space has been blasted out and a receiver installed so as to keep the drills steadily at work. The ore is trucked to the shaft and raised by a steam-hoist. Two 60-h.p. boilers, an Allis-Chalmers air-compressor, hoisting plant, and dynamos have been installed. The main shaft is down nearly 100 ft. and driving will be carried on when this level is reached.

Mr. Scott, the snperintendent of the Foster mine, is in Toranto procuring modern machinery and engaging laborers.

F. E. Hewitt, representing extensive Pittsburg interests, is seeking for opportunities to make large investments in Cobalt propositions.

W. G. Miller has returned to take charge of Government operations on the Gillies timber limit.

Salt Lake, Utah.

Concentrator for Utah Development Co.—New Company to Operate at Ely.—Reduction of Freight Charges for Tintic Ore.—Fortuna Mining Co. to Have Aerial Tramway.—Strike on Scottish Chief.

The Markham Gulch Milling Co. has been organized by E. R. Hastings, J. W. Horne, and A. J. Orem, of Boston. Ground has been broken for a concentrating mill to have capacity for the treatment of 200 tons of ore daily from the Utah Apex and Utah Development companies' mines, both of which are practically under the same control and management. The first-named company has been sending ore to a custom mill for treatment and last week marketed concentrate which netted $40 per ton.

Copper Glance, a Bingham property, is developing quite satisfactorily and is believed to have an extension of the orebody opened in the Ohio copper mine. There has been much local demand for the stock, which has been bought at a big advance.

Eastern parties are considering the purchase of a control of the Standard copper property, in Bingham, and an examination is in progress.

The Salt Lake Ely Mining Co. has been organized to operate at Ely, Nev. Eleven claims have been acquired, all located at Ely and not far from the properties of the Cumberland Ely and Nevada Con. companies.

The Tintic Mine Owners' Association has succeeded in obtaining from the railroad companies entering that camp a slight reduction of freight charges on ore shipped to the Salt Lake valley for smelting. The reduction amounts to 25c. per ton on all ore of a gross valuation of $25 per ton. The reduction, however, is not satisfactory to the producers who contend that they are not being accorded the treatment given to producers of other districts of the State where charges are based on the net value of the ore shipped.

The Utah Development Co., of Bingham, has been shipping concentrate to the Salt Lake smelters which netted about $10 per ton.

The Fortuna Mining Co., of Bingham, has completed a survey for an aerial tramway system, which will convey ore from the mine to the Copper Belt railroad. Sidney Bamberger, of Salt Lake, is manager of this company.

The ore shipments from Park City last week amounted to 1,904 tons, the contributing mines and amounts being: Daly-Judge, 603; Silver King, 613; Little Bell, 21; Ontario, 53; New York, 10; Daly-West, 502; other mines, 102 tons.

The management of the Scottish Chief mine, near Park City, has reported an important strike of ore on the 300-ft. level, where a 3-ft. vein of ore carrying 7.5% copper, 32 oz. silver, 6% lead, and $1.80 in gold, has been opened.

Development work will shortly be resumed on the Silver Bell property at Park City. N. W. Sonnedecker, of Salt Lake, is manager.

The Golden Bell Mining Co., to operate in Park City, has been formed. L. B. Wight, of Park City, is secretary.

Word comes from Gold Butte, Lincoln county, Nevada, that the adit being driven to develop the Gold Butte mine has cut another orebody. This property is owned by a Salt Lake syndicate.

The directors of the Utah mine, at Fish Springs, have posted the regular dividend of $3,000, and an extra dividend of $2,000.

The directors of the Uncle Sam Con. Mining Co., operating in the Tintic mining district, have decided to pass the October dividend. A shortage of cars is given as a reason for not getting a larger tonnage to market during the past month.

The management of the Scranton Mining Co. has shipped 250 tons of ore to New York to be tested. The company may decide to build a plant for the treatment of low-grade ore on the ground. W. H. Brammel, of Salt Lake, is manager.

The Bingham Con. is making some important changes at its smelter at Bingham Junction. To make room for one of the new reverberatories, a blast-furnace (in use for some time) has been torn out. The foundation has been completed for the new stack, to be built of reinforced concrete and to a height of 250 ft. This company has expended, it is claimed, $175,000 for experiments and in the installation of a system for the saving of the flue dust and diluting of the sulphurous gases.

Owing to a coal shortage, the Consolidated Mercur Gold Mines Co. at Mercur has kept its mill in operation under the most difficult circumstances.

Cripple Creek, Colorado.

Vein Cut in Morning Glory No 4. — New Mill to Be Built at Bull Hill. Satisfactory Developments at Portland Mine.

Among the various leases operated by the Western Investment Co. is one on the Morning Glory No. 4 claim. A cross-cut is being driven at a depth of 550 ft. and a vein has recently been encountered, which, when developed more thoroughly, is expected to open up into an orebody of fair size.——The erection of another cyanide mill will be commenced shortly in the district. J. B. Shipman and R. J. Grant, formerly connected with Stratton's Independence, Ltd., propose to construct a mill on the ground of the Lillie mine, belonging to the Vindicator Gold Mining Co., at Bull Hill. The capacity will be 100 tons per day and the dumps of the Lillie and Vindicator as well as the low-grade ores of those mines are to be treated.

The Portland Gold Mining Co. paid a quarterly dividend of five cents per share on October 15, amounting to $150,000, bringing the amount of the total dividends paid by this company to date up to $7,147,000. A circular letter by Irving Howbert, the president, has been sent to the shareholders, in which it is stated that the three winzes which have been sunk from the 1,100-ft. level have shown up very well. Two of these are near No. 1 shaft and a third a short distance from No. 2. One of those near No. 1 shaft has been sunk 150 ft. in good ore, while the other is now down 50 ft. with an excellent showing at the bottom.

High-grade ore has been encountered in the winze near No. 2 shaft all the way to a depth of 140 ft. This development work shows that the orebodies continue to a greater depth than heretofore supposed.——The output from the Portland mine since the beginning of the year has averaged 9,000 tons per month, which compares favorably with the production for the last two years. The value per ton has decreased somewhat. The reasons stated for this decrease are: (1) Veins have been mined to their full width so that they will not have to be gone over again, taking out low-grade ore from the walls. (2) The timber in the old stopes near shaft No. 1 is decaying rapidly, necessitating either abandoning the fair-grade ore still remaining on the walls of those stopes, re-timbering at a heavy cost, or to extract this ore as quickly as possible. The latter course has been adopted, giving a fair profit in spite of the rather high cost of mining. The high-grade ore was taken out of these stopes six years ago. The circular also states that the company has no intention of leasing any portion of the mine.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

A strike has been made in the mine owned by T. I. Coleman and L. W. Riggin, situated near Troy. A four-foot vein of high-grade ore has been proved by an inclined shaft 120 ft. deep and an adit 180 ft. long. The vein lies in a contact between quartzite and schist, the vein-filling being principally rose quartz.——Copper ore assaying 40% has been encountered in a two-foot vein in the Riverside group. The ore is mainly chalcopyrite and bornite.

GILA COUNTY.

The sulphide vein has been cut on the 800 level of the Copper Hill mine belonging to the Arizona Commercial Copper Co. The size and value of the sulphide orebody has not yet been determined, and it will probably be slow work opening it up, as the ground is wet and very heavy.——The Globe Consolidated is going ahead with the work of sinking and equipping the Gem shaft, which has reached a depth of about 65 ft. The whim on the shaft was replaced by a steam-hoist last Saturday.

MOHAVE COUNTY.

(Special Correspondence).—Unprecedented activity in the mines of this county is reported.——It is now understood that a sale of the Bimetal mine, at Kingman, will soon be made for a large figure. The mine is one of the largest gold-bearing properties in the county. Its proximity to the Santa Fe Pacific railroad makes it very desirable.——The Arizona-Mexican Mining & Smelting Co. is working the Champion mine in Todd basin and getting rich lead ore. The mine was a big producer in the early days of the camp. ——Wells Bros. have located the old I. & L. mine in the Wallapai mountains 15 miles southeast of Kingman and have been at work on it since the cool weather began. A drift was run in to cut the vein at a depth of about 500 ft., and from this drift ore running high in silver is being taken. The average of a big pay-streak is said to be $75, but ore running several hundred dollars can be sorted.——S. A. Taylor has four men at work on his mine at Mineral Park. The orebody is one of the largest and richest in the county, 14 ft. of it running better than $6 gold and $3 silver per ton. The last carload shipment from the property netted more than $2,000. The depth attained in the mine is over 100 ft. and sinking will soon be resumed.——U. H. Taggart, of the H. H. Taggart Mercantile Co., of Kingman, has just returned from Los Angeles, where he made a deal on the C. O. D. mine at Cerbat, and the purchasers will soon visit the property. The C. O. D. mine is one of the best properties in Wallapai district.——It is understood that there will be a consolidation of several of the big mines of Cerbat, and that later a large reduction plant will be installed to handle the ore. The mines composing the consolidation are all good bearing properties, and lie close together, making it possible to work them through one shaft.——Stockton Hill is active in mining operations. The De la Fountaine mine is being worked, while at the mill, work is progressing rapidly. At the Star Spangled Banner mine, the Arizona-Mexican Mining & Smelter Co. is taking out rich lead ore. The mill is completed and will soon be put in commission.——Barney Perkins, of Mineral Park, is preparing for an extended prospecting trip into the country south of Bill Williams fork. That section of the country is reputed to be rich in gold and copper, and will be thoroughly prospected this fall.

Phoenix, October 12.

YAVAPAI COUNTY.

An important mining deal was perfected yesterday when the title to a one-third interest in the Snowflake and Cedar mining claims in the Cherry Creek district was passed from F. L. Scheerer to W. C. Metzger. These claims are among the most promising in the district and will, within a short time, be the scene of active operations.——A shaft on the Snowflake claim, sunk to a depth of 150 ft., from which levels have been run, exposes a body of free-milling gold ore of good grade, averaging a width of 40 in., while surface openings on the other claims show the vein to be equally promising. In the immediate vicinity of this property the Climax Mining Co. is engaged in the installation of a mill which it is expected will be in running order within the next thirty days, when a force of men will be put to work extracting ore from large bodies which have already been opened.

CALIFORNIA.

INYO COUNTY.

The Lucky Jim mine, three miles north of Darwin, has been sold by J. A. McKenzie to the New Coso Mining Co. The Lucky Jim, with the Christmas Gift, is one of the old-time properties of that part of the county. A great deal of work has been done there. During Darwin's best days the Lucky Jim camp had a population of 300. The largest two-stack smelter in the county was built at Darwin for reducing ores from the two mines. The hoisting plant over one shaft was burned several years ago, but was replaced with another by Mr. McKenzie. The deepest mining is 425 ft. below the surface.

NEVADA COUNTY.

Asbestos has been found in the Washington district, and samples were shown here yesterday by J. T. Dillon and F. T. Smith. The deposit is situated on the South Yuba river on the north side, and is about 200 ft. wide. In this formation there are hundreds of stringers of asbestos, and the find should prove a valuable one. —— The new five-stamp mill at the Republic mine, near Graniteville, is completed, and the framework has been put up for five additional stamps. It is the intention of the owners of the mine, McLean, Foss & Co., to keep the stamp-mill running steadily all winter. —— After more than a year's trouble the Ironclad mine has finally been unwatered, with the result that the management has been able to enter the 400-ft. level and examine the vein. In the stope the vein is two feet wide and has the appearance of containing valuable milling ore. The water is running in at about 200 gal. per min., and the pumps have a capacity of four hundred gallons.

George Shebley and Joseph Orzalli have bought a five-stamp mill and will move it from You Bet to their mine near Chicago Park. A tunnel is being run to strike the bottom of the shaft, which is down 90 ft.——The Union Hill Con. mine on Banner hill, near Nevada City, has been sold to John J. Myers and C. F. Humphrey, who are interested in the Murchie mine at Nevada City. The Union mine was owned by a local company, which has been operating the mine for some time and has sunk the shaft 200 ft. and driven about 400 ft. The local owners were not provided with means to do development work and erect the machinery necessary for deep mining. The property consists of two claims and runs 3,000 ft. on the vein. The new owners will form a company to be known as the Union Con. Mining Co., and will sink the shaft several hundred feet.

SAN BERNARDINO COUNTY.

The American Eagle Mining Co. expects to commence active development work about October 15. H. H. Ahrens is to take personal charge of the work. The mines are situated in the Whipple mountains, 40 miles south of Needles, and have been largely developed. The orebodies run high in copper and therefore shipping facilities to the smelter at Needles are greatly needed.

SHASTA COUNTY.

T. W. Lawson issued a statement to the stockholders of the Trinity Copper Co. to the effect that all the general conditions and details for the contract between his company and the smelter people had been agreed upon, and that it would be executed by order of the directors of both companies at meetings to be held within two weeks. —— N. W. Keith, superintendent of the Mad Ox mine, near Whisky town, was in Redding last week to dispose of a gold brick—the product of the first run made with the new 10-stamp mill. From 16 to 20 men are employed steadily at the mine. The Cariboo Gold Mining Co., which has a bond on the Mad Ox, is working the mine on a systematic plan of development. The owners are J. F. Schilling, Louis Reel, and Woodward.

Experimental works are being erected on the Pit river,

east of the mouth of the McCloud, to test the possibility of working the iron ore deposits by means of the Heroult process. The company experimenting on the iron deposits is under the direction of H. H. Noble, president of the Northern California Power Co., and C. E. Petinot. C. B. Morgan is in charge of the operations on the Pit river.

The Balakala Con. Copper Co. has received patents on the Gold Nugget, Togo, and Nogi claims. These cover an area on the Coram townsite, the title of which was contested in the spring. The laying of track on the smelter spur has now been begun and the heavy grading finished. This will overcome the transport difficulties which have been a serious hindrance in the building of the new smelter town. —— Increased activity is reported at the Midas mine, in Harrison gulch, since the completion of the 700-ft. raise, which is now being equipped as the main hoisting shaft.

TUOLUMNE COUNTY.

(Special Correspondence).—It is reported that the Standard Electric Co. intends extending its wires to Groveland within the next few weeks and that it will compete with the local electric company in supplying power to the mines in that vicinity. The local company is already supplying several mines in that neighborhood, among which are the Mack and Longfellow.——Operations are soon to be resumed at the Arbona mine near Tuttletown, which recently passed from the control of the Equitable Mining Co. to the Calmas Co., of Boston, Mass., a newly organized corporation.——A steam-hoist has been installed at the Eureka mine, situated one mile east of Jacksonville. Sinking is to be resumed. The shaft is 200 ft. deep.——The Tuolumne County Water & Electric Power Co. will shortly run wires from Rawhide to the marble quarries near Columbia by way of Tuttletown for the purpose of conveying power to the points named.—— Liens aggregating $4,000 have been filed against the Black Oak mine by former employees.——A hoist and pump will shortly be installed at the Bullion mine on Knight's Creek and development work vigorously prosecuted. Rich ore has been uncovered at the 80-ft. level, where the vein is eight feet wide.——Several men have been put to work at the Hope mine near Sonora, a combination pocket and milling property. An adit is being driven to open up orebodies at a considerable depth. Heretofore it has been worked by means of a shaft.

Tuolumne, October 15.

W. J. McRay, manager of the Clio property at Jacksonville, returned from Los Angeles to resume sinking operations at this property. The shaft is to be carried down to 600 ft., the present depth being 400 feet.

YUBA COUNTY.

Walter E. Trent is engaged in prospecting for a copper lode on the Mackey ranch, at Camptonville. The shaft is now down about 50 ft., and Mr. Trent will let a contract to sink it 50 ft. deeper.

The South Yuba Mining Co. has sold its holdings comprising 10 claims on the north bank of the South Yuba river. The mine was recently examined by J. Neill and T. Varden. Six adits have been driven on the property, almost from the top of the mountain down to the bed of the river, and each has struck the orebody, which has been cut in places from 38 to 56 ft. without going through the lode. The copper ore ranges from 2½ to 30%, besides carrying $5 per ton in gold and silver.

COLORADO.

BOULDER COUNTY.

(Special Correspondence).—The Fourth of July mines being operated by the Consolidated Copper M., M. & S. Co., on the south base of Arapahoe peak, has an adit 2,760 ft. which cuts the hill 700 ft. below the surface. The deepest shaft on the property is 360 ft., but, on account of the large volume of water in the shaft, they were obliged to abandon same and start a 3,000-ft. adit to tap the orebody underneath the shaft. This adit was started some four years ago. From present indications they will have to drive the adit something like 75 ft. before tapping the vein which they are after, and after that will make a raise to the surface. Several promising veins have been encountered since the adit was started. J. B. Johnson is president and M. P. Givens secretary.

Eldora, October 13.

CLEAR CREEK COUNTY.

(Special Correspondence).—T. H. Tracy, manager of the Taawasa Gold Mining & Cyaniding Co., expects to have his mill running within the next thirty days. He has overhauled the old mill belonging to the Idaho Springs Reduction Co. and put it in first-class shape for handling the ore from the Taawasa mine, as well as their property at Empire. Some original ideas are being carried out in this plant, especially the dewatering system for handling the concentrate. Instead of having a concentrate box at each table the concentrate will drop from the table to a slot in the floor to a conveying belt which conveys it to the drying apparatus. This scheme, if a success, will be quite a departure from the ordinary way of handling concentrate.

Idaho Springs, October 13.

A large vein was encountered in the breast of the Newhouse adit and a large quantity of mineralized vein matter broken through, making the width of the vein as near as can be ascertained about 27 ft. None of the samples of the ore assayed enough to warrant stoping, the point of intersection being a barren place in the vein with no slips or feeders coming in.——The old Wing mine, located on Democrat mountain, which has remained in idleness since 1877, has been leased to Chas. Estelle & Co. for a term of years. Development has already been put under way. In the breast of the adit there is now showing from 5 to 16 in. of ore which carries average values of 19 oz. silver and 30% lead.——William Rogers, manager of the Santiago mill, has purchased a small dump at the Burleigh tunnel workings from the Dives-Pelican Seven-Thirty Mining Co. The entire product is to be hauled to the mill at Georgetown, where it will receive concentration.

LAKE COUNTY.

S. Storm, the owner of the Bedford group of claims in Sayer's gulch, arrived last week and has let a contract to E. B. Harlan to continue driving on the Delaware claim.—— The recent development work in the lower adit on the Golden Fleece group, operated by the Parrot Mining & Milling Co., has opened up a body of very good ore, assaying from 5½ to 22% copper, and carrying also good values in gold and silver. High-grade copper ore is unusual on Bull hill, and the Golden Fleece is the only place where this metal has been found in paying quantities. The adit has been driven over 300 ft., and is at present 200 ft. below the surface; the last 40 ft. is in rock thoroughly mineralized, and in which frequent streaks of good ore have been found.

PITKIN COUNTY.

A big strike is reported to have been made at the second level of the Smuggler-Union mine. The ore was discovered first in small pockets, but in the last day or two has developed into a big, rich strike.

PUEBLO COUNTY.

Four men were killed as the result of the blowing out of the bosh in furnace D at the Minnequa plant of the Colorado Fuel & Iron Co. Several others are said to be more or less burned by the hot iron. Although constantly in use for years it was believed to be in a perfectly safe condition, and aside from the fact that the furnace had probably been weakened by the heat from within, no explanation is offered as to the cause. This is the second accident of the kind at the plant in the last two years, although no serious trouble has been experienced with the furnaces since J. H. Means, the present superintendent, took charge.

SAN JUAN COUNTY.

The Animas Power Co's. plant near Rockwood, which has been supplying power to various mines and mills in the district, had a serious accident a few days ago. It seems that while one of the engineers was shutting off the water in the plant, he closed the valve too quickly, with the result that the pipe could not withstand the terrific pressure and was forced apart in several places. It will probably be several days before the company is ready to furnish power to its customers, but luckily many of the properties are equip-

ped with steam-plants, so that they can continue operations. Several hundred feet of steel pipe was rendered useless as a result of the accident.

SUMMIT COUNTY.

(Special Correspondence).—An important strike has been made on the Lucky mine on Mineral Point, the property of the Beaver Creek Mining & Milling Co. The ore is high grade in lead and carries gold and silver, so that it can be shipped as it is mined. The property is also producing large quantities of mill-dirt which is being treated by its own concentration plant.——The Jessie is now running smoothly and is employing 28 men continuously. The 40-stamp mill is running full time and is producing from $3,000 to $4,000 of gold per month.——C. L. Lightburn, of Denver, is making arrangements for resumption of work on the property of the Gold Run Mining & Milling Co.——The Country Boy, on Nigger Hill, is preparing a shipment of 500 tons of high-grade zinc ore for Iola, Kansas.——The Pennsylvania is making regular shipments to the Chamberlain & Dillingham Ore Co.'s works at Breckenridge. Mr. Lewald, general manager, states that he will install a large electric power-plant on the Snake river next spring and double the capacity of his mill.——E. E. Loring, manager of the Hoosier Creek Gold Mining Co., is making arrangements for unwatering the shaft, and to continue sinking. If the vein continues to dip at its present angle, the shaft should pass through it at 300 ft. The shaft is now down 100 ft. and is equipped with a good hoist. The vein is 105 ft. away from the shaft at the present level and has been reached by cross-cut. Raises and stopes on the vein have opened up good ore.——The Wonderful-London, which adjoins the Hoosier Creek, has its main shaft down over 400 ft. As soon as the lime contact is reached, drifts and raises will be started to block out ore. The ore already shipped is high grade.

The Atlantic mine on North Star is making regular shipments of gold ore which run from 3 to 5 oz.——The Pacific is also shipping to the smelters, a good grade of galena carrying gold. The property is being worked by W. P. Condon under lease. The main tunnel of the Gold-Dust property which adjoins it is being used as a right-of-way. A winze 75 ft. deep has been sunk below the tunnel, and drifts and raises have been run in the ore from the bottom of the winze.——The Gold-Dust company is now sinking on the ore-shoot recently opened up, and will operate below the main tunnel level by winzes and drifts. The pumping plant recently installed is working well. The Excelsior mine, at Frisco, will soon be working a full force, taking out shipping ore. The ore averages over $40 per ton. Besides the high-grade streaks, the veins carry large quantities of milling ore, which can be treated by the company's own plant. Excavation is being made for the compressor plant.——At the Square Deal, in the North Ten Mile Canyon, the camp buildings are completed. The main adit is now in over 200 ft. toward the centre of Chief mountain, where rich veins are expected to be cut. The veins on the surface make a fine showing. W. W. Wonser, treasurer of the company, has been at the mine with Eastern visitors.——Jack Norman has struck rich ore in the Hope, which adjoins the Square Deal. He is building a cabin and blacksmith shop and will immediately start a tunnel.——Atherton and party have let a contract for the location of work on their claims on Chief mountain.——The King Solomon is continuing its main development adit toward Mount Royal.——The Columbine, at Robinson, has resumed its old-time activity under the management of Samuel Doran.——The Summit Mining Co. is operating the east shaft of the Robinson mine, which is down 300 ft., and is to be extended 225 ft., to the second contact. The property is well equipped with hoisting machinery and a battery of three large boilers and pumps. Frank Bulkley is manager.

Breckenridge, October 10.

TELLER COUNTY.

William Foley, manager for the Ætna Mining & Development Co., operating a lease on the Index mine on Gold hill, has cross-cut in the fourth level the Pointer vein, for which he has been searching for several weeks. The vein carries good values.

IDAHO.

SHOSHONE COUNTY.

The California mine on Nine Mile, two miles from Wallace, has struck a rich shoot in the No. 4 level. The new orebody has already been proved to be over 15 ft. wide. About 15 or 18 in. of it is solid galena. The rest of the 15 ft. is all high-grade concentrating ore and will probably average as much as 20% in lead. Owing to the dip of the vein, the 300 ft. of vertical depth now obtained will give approximately 800 ft. of backs.——North & Eberhardt have recently bonded for Charles F. O. Merian 800,000 shares of the capital stock of the Black Bear Fraction Mining Co. The property consists of four claims and a fraction and is traversed by two veins. One is known as the Brown Cub vein and the other is the same which contained the great Black Bear ore-shoot of the Frisco mine.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—According to the latest information from the headquarters of the Santa Fe railroad in Los Angeles, within seven weeks the first trainload of passengers will be pulled into Searchlight. This means much to the camp as machinery and supplies now have to be hauled 22 miles by team, and the four stages handling the passenger traffic are barely equal to the task.

In the shaft of the Searchlight Consolidated M. & M. Co., good showings have been encountered and high assays obtained from the surface croppings on the Oregon group.

The Searchlight, Wyoming, at a depth of 209 ft. has struck good ore but will continue sinking and driving.——The Bamberger-Wheatley Mining Co. has done 500 ft. of sinking and driving, and trenching has been started. It is the intention of the company to develop all the claims as fast as the work can be accomplished. The ore has averaged $7 per ton from the grass roots down and is now running as high as $40.——All the contract work has been completed on the Nevada Consolidated property, the shaft on the Loder claim being 225 ft. down with good showings.——In the Drake shaft on the Quartette property they have sunk 250 ft., but encountered so much water they did not carry out their original plan of cross-cutting at that level. Instead they are cross-cutting toward the main vein of the Quartette itself. This property still continues to get better and from present appearances there seems to be an enormous supply of ore in sight. It is stated on good authority that the dividends will soon be increased from $15,000 per month to $30,000, and this, considering the extensive improvements in the company's buildings, is a remarkable showing.

The Cyrus Noble Extension shaft is down 164 ft. and at 158 ft. they encountered an east and west vein which is undoubtedly the vein of the Duplex as the ore in general appearance is exactly the same and carries high values. The Duplex which adjoins this property is the first mine located in Searchlight and was sold to John Brockman of the Commonwealth mines of Arizona and Count Portalis for $265,000. The Cyrus Noble Extension shaft is only 1,500 ft. from the Duplex shaft.

Searchlight, October 12.

Big strikes are being made 20 miles southwest from Eldorado canyon, 20 miles northwest of Searchlight, and five miles from Crescent, Nevada, in what is known as the Golden Triangle. The new camp is situated in the Bird Spring range in Lincoln county, southern Nevada, two miles from the main line of the Clark road.

WHITE PINE COUNTY.

The new railroad running between Cobre and Ely, a distance of 140 miles, has been completed and is now in operation. Nevada Consolidated interests, which control the road, are now in a position to push the work of building their smelter and concentrator to completion. It was necessary to complete the road before the machinery could be shipped to the Nevada Con. Co.'s property.

OREGON.

JOSEPHINE COUNTY.

An important mineral find has been made almost within the limits of the city of Grants Pass, the discovery consist-

ing of an eight-foot vein of molybdenite. Development will be immediately commenced.

UTAH.

SALT LAKE COUNTY.

The Western Utah Copper Co., controlled by D. MacVichie and others associated with Bingham interests, has been recently formed to operate the Gold Hill mine in the Deep Creek district. The mine was secured under option several years ago, and since that time active development has been carried out with gratifying results. The property is 30 miles from the main line of the Western Pacific railroad and is situated near Clifton in the Deep Creek district. The installation of the new compressor at the Fortuna mine at Bingham is progressing.——A decided victory for the smelting industry of the Salt Lake valley was the decision rendered on Friday afternoon in the case of Morthouse against the Utah Consolidated Co. The plaintiff several months ago brought suit against the Utah Consolidated for damages said to be caused to the plaintiff's crops by the smoke from the smelter of the defendant. Damages were asked to the extent of $3,000, and the case was decided in favor of the Utah Consolidated Company.

WASHINGTON.

STEVENS COUNTY.

The smelter at Northport has been unable to start operations owing to the shortage of coke caused by the strike at Fernie, B. C. One furnace was ready to start up on October 15, a second on November 1, and a third as soon as the present contract for Le Roi ore at the Trail smelter was out. There are six furnaces at Northport which can treat 1,200 tons of Le Roi ore per day.

FERRY COUNTY.

After testing the ore from the Republic camp Mr. Potter considers that he can successfully treat it at the place of production by a milling process, to come within a reasonable cost and enable ore of as low a grade as $6 per ton to be mined and treated at a small profit. It is proposed to amalgamate the mines, equip them with modern and more powerful machinery, and work on an extensive scale.——The Keller & Indiana Con. Smelting Co. has completed the construction of its smelting plant.

OKANOGAN COUNTY.

(Special Correspondence).—The Palmer Mountain Tunnel & Power Co. is employing electric drills, grading for the mill, near the mouth of the Palmer Mountain tunnel. It is expected the machinery for the mill will be delivered by the Vancouver, Victoria & Eastern railway at Nighthawk as soon as the rails are laid to that point, about the last of December. From Nighthawk it will be hauled to the mill-site by teams, a distance of 10 miles. An electric engine will be used for the removal of ore and waste from the adit. The light T rails are being replaced by heavier ones. The extension of the adit into the hill and the exploration of the veins already encountered will be started without delay. ——In the Copper World Extension mine a cross-cut has been driven 60 ft. on the 300-ft. level, and the shaft is being sunk from the 300 to the 400-ft. level. A change has taken place in the management of this property. Henry Bahrs, who has had charge since the incorporation of the company, has been superseded by R. J. Thomas, of Findlay, Ohio, and Bert Wentworth's place, as foreman, has been given to Clayton Baldwin.——The Ruby mine, at the base of Mt. Chapaca, is looking well, and the rich streak of sulph-antimoniate ore still holds out in the raise. Mr. Harman, manager, expects to take out 1,000 tons of an average value of $100 per ton by the time the Vancouver, Victoria & Eastern railway gets to the mine. The drift from the No. 1 adit on the Phil Sheridan mine, at Sheridan camp, is in 227 ft., and the face, 4 ft. wide, is in good ore. Recently 19 tons of ore was shipped to the Granby smelter which assayed $59 per ton. A large tonnage of low-grade ore remains on the dump, which assays from $12 to $25 per ton. No. 2 adit has been driven 30 ft. on the vein. No. 4 adit will be started shortly and given an additional 75 ft. vertical depth below the No. 3. The latter is in 116 ft. and will tap the vein at a depth of 152 ft. It has about 150 ft. further to run. The company anticipates letting a contract for the work and is figuring on a 50-ton concentrating mill, to be installed a half-mile distant, on the west fork of Toroda creek. The company also intends building a tramway from the mine to the mill.——The Viola Copper-Gold Mining Co. has driven an open-cut 125 ft. across a vein on the Jupiter claim, which is 15 ft. deep at the face and in galena with lead carbonate. The open-cut is five feet wide and shows low-grade ore on both sides. In the floor is quartzite which assays in gold, silver, copper, and lead. On the Americanetta claim two cross-cut tunnels have been driven.——The Viola group is on the southern slope of Eneas mountain, 18 miles south of Loomis.

Loomis, October 10.

O. D. F. O. Mudnutt, general manager of the Multnomah Mining, Milling & Development Co., announces that work is being pushed on three groups in Nespelem camp. The Nespelem river will be dammed preparatory to installing a power plant.

SPOKANE COUNTY.

Frank T. Post, of Spokane, has bought the Spokane Smelting & Refining Co.'s smelter, five miles west of Spokane, and it is given out it will be put into operation some time in October. The plant was erected 16 years ago, but it has never produced bullion. Philadelphia and Grand Rapids, Mich., capital is said to be behind the deal.

STEVENS COUNTY.

The Young tungsten mines, south of Deer Trail, are reported to have been sold to German interests identified with the Krupps. The claims were located 12 years ago by C. H. Young and M. F. Gibson, of Davenport. The purchasers announce that they will erect a concentrator this fall and ship the product to the Krupp ordnance works. The same people have taken a bond on molybdenum mines, which are 15 miles north of Davenport, in Lincoln county. These are known as the Putney Butte mines.

WYOMING.

CONVERSE COUNTY.

A large acreage of Niobrara shale, within six miles of Douglas, has been taken up to supply a proposed Portland cement plant. The shale at Douglas lies flat on the surface for a depth of 25 ft., so that it can be dug with a minimum of expense, it being necessary to remove practically none of the surface. The Douglas gas wells are within seven miles. —— State Geologist H. C. Beeler is investigating the shale possibilities of the newly opened Wind River reservation. If good shales are found there, the attention of manufacturers will be called to the fact, and the new reclamation enterprises in the reservation may have the advantage of cement made close at hand.

BRITISH COLUMBIA.

The strike of the employees of the Crow's Nest Pass Coal Co. is not so disastrous to the mines and smelters as was at first expected. Advantage is being taken of the shortage of coke to attend to repairing, developing, and shaft sinking, with the result that a full force of men is working at most camps.

At the Centre Star, the 650-h.p. Westinghouse motor is in position in the compressor building, and the cement foundation for the new hoist is completed. At Le Roi, the sinking of the shaft from 1,150 ft. will begin immediately. The development of the new territory west of the dike in the Black Bear is being proceeded with, and the ore-shoots there are looking fairly well.

Charles Biesel, the superintendent of the Snowshoe, has discharged the employees and temporarily closed down the mine, owing to the shortage of coke.

The smelter of the Consolidated Co., at Trail, will be closed down in a day or two for want of coke. The management will take advantage of the opportunity afforded to make extensive repairs and improvements to the plant, which have been under contemplation, but which could not be successfully accomplished while everything was in operation. This work will give employment to nearly all the employees.

Personal.

C. A. MOLSON is at Butte.

J. R. FINLAY is at Goldfield.

ARTHUR L. PEARSE is at Salt Lake City.

J. PARKE CHANNING has returned to New York.

F. W. BRADLEY and MARK L. REQUA are in New York.

J. W. MERCER was married at London on September 14.

R. A. PARKER is examining mines in southwestern Colorado.

W. B. DEVEREUX, JR., has returned to New York from Kendall, Montana.

H. VINCENT WALLACE has returned from England to Nogales, Arizona.

SAM. W. CHEYNEY is manager of the Sierra Alta mine in Sierra county, California.

R. B. WATSON, of New York, is inspecting mines in the Cananea district, Mexico.

HENRY HARRIS is superintendent of the Hall smelter at Nelson, British Columbia.

GEORGE E. GUNN is manager of the Cumberland-Ely copper mines, at Ely, Nevada.

J. P. HARVEY is superintendent of the Furnace Creek mine in Inyo county, California.

GILBERT T. ROOTE has returned to San Francisco from examining mines in Trinity county.

C. J. REYNOLDS is superintendent for the Guerrero Development Co., at Chilpancingo, Mexico.

M. L. MCDONALD is inspecting mining properties near Forest City, Sierra county, California.

F. W. MACLENNAN has returned to Salt Lake from an investigation of mines at Pioche, Nevada.

ROBERT W. DAVIS, JR., manager of the Old Hundred Mining Co., Silverton, Colo., is in Denver.

A. W. HUDSON has been appointed manager for the Rigby reduction works at Mayer, Arizona.

ALEXANDER N. ALLISON is the new superintendent of the Annie Laurie mine at Kimberly, Utah.

W. C. THOMAS is in charge of the Boundary Falls smelter of the Dominion Copper Co., British Columbia.

CHARLES HUTCHINSON has returned to San Francisco from the American Mining Congress at Denver.

MARK R. LAMB, recently appointed consulting engineer to Chas. Butters & Co., is on the way to South Dakota.

NEWTON W. EMMENS has been appointed manager for the Broadview mine, Trout Lake City, British Columbia.

FRANK H. PROBERT has returned from an extended trip through the Guadalupe y Calvo district of Chihuahua, Mexico.

GEORGE A. PACKARD passed through San Francisco on October 16, and will visit Goldfield and Denver on his way back to Boston.

H. L. JOHNSON has been appointed superintendent of the Tightner mine, near Downieville, Cal., in place of W. S. Hoskins, resigned.

CYRUS W. DAVIS, treasurer of the Gold King and Gold Prince mines, is in Denver on his way to visit the mines at Silverton from Waterville, Maine.

JOHN L. WITNEY has resigned as superintendent for the Lowell & California Mining Co., and has opened an office at 417 Hellman Bdg., Los Angeles.

E. W. SEBBEN has returned to Denver from Silver City, N. M., where he made an examination of an old Spanish mine. He is now at Wickenburg, Arizona.

THEO. B. COMSTOCK is engaged in extensive investigations in southern California, Mexico, and Nevada in the interest of five distinct groups of Los Angeles clients.

Trade Treatises.

ALLIS-CHALMERS CO. have issued Bulletin No. 1053, describing the products of their electrical department.

THE WILSON ORE TREATING CO., of Denver, have issued their first descriptive catalogue of their Rapid Concentrator.

Ore Feeder Bulletin No. 1 issued by the COLORADO IRON WORKS illustrates and describes the Challenge Ore Feeder manufactured by that company.

STEPHENS-ADAMSON MFG. CO., of Aurora, Ill., are issuing a monthly publication devoted to the description of conveying and transmitting machinery.

Bulletin No. 18 on Magnetic Separators has just been issued by the DINGS ELECTRO-MAGNETIC SEPARATOR CO. of Milwaukee, Wis. It describes in detail this excellent system.

Books Received.

THE ECONOMICS OF RAILROAD CONSTRUCTION, by W. L. Webb. Published by J. Wiley & Sons, New York. This volume of 339 pages deals with the operation, maintenance and construction of railroads. Questions of working expenses, locomotive and car construction, train resistance and the operation of heavy trains on grades and curves are discussed in detail. This book is written from the standpoint of the constructing or operating engineer, and only touches on legislation and kindred subjects in so far as they affect questions which must be answered by the railroad engineer. The convenient size and clearness of the book should recommend it to those interested in railroad science.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, October 17.

Con. Virginia	$0.81	Manhattan Con	$0.8
Ophir	2.90	Jumping Jack	0.6
Savage	1.15	Midway	2.2
Tonopah Ex	6 00	Montana	3.7
Belmont	6.85	Mohawk	4.3
Jim Butler	1.45	Silver Pick	0.8
Jumbo	1.55	Sandstorm	0.6

METAL PRICES.
By wire from New York.

	Closing Prices	
	October 11.	October 18.
Copper—Lake (cents per lb)	20.70 @21.31	21.70 @22⅛
" Electrolytic "	20¼ @20.90	20 @20.90
" Casting "	20 @20¼	20¾ @21¾
Lead "	5.75	5.75
Spelter "	6.15	6.03@6.06
Silver (cents per oz.)	68⅝	69⅞

ANGLO-AMERICAN SHARES.
Cabled from London.

	October 4.	October 18.
	£ s. d.	£ s. d.
Camp Bird	1 7 0	1 8 3
El Oro	1 8 1½	1 8 3
Esperanza	3 3 0	.. .. ..
Dolores	1 15 0	1 13 9
Oroville Dredging	1 1 3	1 1 0
Stratton's Independence	0 4 0	0 3 9
Tomboy	1 8 9	1 9 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices	
	Oct. 4.	Oct. 18.
Bingham Central	2⅜	2⅜
Boston Copper	31⅜	33⅛
Calumet & Arizona	16¼	.....
Cumberland Ely	12⅞	13¾
Dolores	8⅝	8⅝
El Rayo	6⅞	6¾
Guanajuato Con	5	5⅛
Giroux Con	13⅜	12⅛
Greene Con	27¼	25¾
Nevada Con	19	22
Nipissing	23	25¼
Tennessee Copper	43	48¾
Tonopah Ex	5⅛	6
Tonopah-Belmont	5¼	6
Tonopah	18⅜	21
United Copper	65⅜	67¼
Utah Copper	32⅞	36½

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PROBABLY nine out of ten ore deposits have some relation to a body of igneous rock. In general, a region free from igneous rocks has a scarcity of ore deposits.

THE proper peripheral speed of hexagonal trommels with fine screens is about 180 ft. per minute. The angle of slope should not exceed 10° from the horizontal.

PUMICE is a glassy lava, which at the time of hardening was so full of steam-filled cavities that it now has a spongy structure and is so light as to float; it is a sort of lava froth.

PATENTED CLAIMS may overlap, and in fact do, in all mining districts, but in making application for patents to claims which lap on ground previously patented, the exact rights desired on the area of intersection must be defined.

IN a deep bin, only a small proportion of the weight of the ore is carried on the bottom, the larger portion—depending upon the depth of the bin—being taken by the sides, where it is resolved into vertical pressure by friction.

ANY lack of parallelism between rolls results in end thrust and the tendency toward wearing away the collars. They should not only be parallel but should also remain truly level. Any departure from these conditions increases the frictional resistance of the machine.

GREENSTONE is a general name applied to certain igneous rocks, usually fine-grained, of a dark green color. They are old rocks geologically and their green color is the result of thorough alteration. They are diabases or diorites, sometimes old andesites, and even basalts.

STRUCTURAL STEEL, if encased in a sound sheet of good concrete, is safe from corrosion for a period longer than a building usually remains undisturbed by changes due to the re-construction of a modern city. Care must be taken, however, that the steel is properly encased in the concrete.

THE adulterants commonly used in the manufacture of rubber are chalk, gypsum, calcined magnesia, asphaltum, barytes, litharge, talc, lampblack, and zinc white. In most cases the adulterants represent more than one-half the 'rubber.' The manufacturers claim that the quality is improved by the addition of certain substances such as zinc white.

PLACER CLAIMS may be taken in twenty-acre tracts, the bounding lines of which must conform with the general system of survey lines established by the Government, but if such survey has not been extended to the district, they must be bounded by true meridian and east and west lines. The survey of coal land is subject to somewhat similar rules.

STANDING WATER in shafts sunk in rocks, as in wells, usually indicates the upper limit of the belt of saturation. But the standing water maintains its uniform level (in the absence of pumping) by flowage through the rocks, compensating the local additions or subtractions. Cracks in the rocks in flooded shafts often become silted up from various causes, and little water flows into the shaft or out of it. The surrounding rocks may become drained while the water-level in the shaft remains practically stationary.

THE Indian coolies imported in Fiji, to work on the sugar plantations, are found to eat large quantities of a decomposed basaltic lava. This rock is so soft as to look like a pink clay. Most of its silica has been removed by weathering, and upon analysis at Sydney it has been ascertained that the earth these coolies eat has a composition close to that of bauxite, a hydrated aluminum oxide.

THE capacity of a crusher of the Blake type depends upon the width of the jaw, the speed at which it is driven, the size to which the ore is crushed, and the character of the ore. The hardest material to crush is soft, talcose, tough stuff, that mashes without breaking. With the jaws set about two inches apart, from 1.25 to 1.5 h.p. per ton of material is required.

THE surveying of mine workings is strictly an economic problem and the surveyor must study it as such. The accuracy attained must be such that the cost in obtaining it and the saving of expense in mining operations through it together effect the maximum of economy. The surveyor bearing this in mind will be neither too careless nor too exact. He will not, for example, close down the mine in order to carry a meridian into it when no important connections are needed, and there are no boundary disputes.

CAMS are made right and left hand because there is some crowding away of the cam from the stamp when in operation; so to equalize this, one battery is made to offset the other, by making the cams right and left. They were so made as early as 1868. In the earlier stamps the crowding away was more marked than it is today. We have no data concerning the origin of right and left hand cams, but presume that it quickly followed the introduction of the round revolving stamp, by C. P. Stanford, about 1853.

THE occurrence of diamonds in a gold conglomerate was determined at Nullagine, in the Pilbarra goldfield of Western Australia. The wear of shoes and dies was abnormally rapid, and, upon investigation, it was proved that the iron was cut by diamonds. A. Gibb Maitland, the State Geologist, ascertained these facts and actually found a number of diamond splinters sticking in the iron. They were portions of small diamonds occurring in the gold-bearing conglomerate, the age of which is at least early Paleozoic, perhaps Cambrian.

THE SURVEYING OF BORE-HOLES. — Bore-holes, whether made by a rotary or a percussion drill, are never perfectly straight, and unless the ground is remarkably homogeneous, are not amenable to any mathematical law. Means have been devised, however, of measuring the strike and dip of a hole at any particular distance from its mouth. The trend of the bore-hole can thus be plotted with some degree of approximation and the position of any particular body or strata struck in the bore-hole determined. One method depends in principle upon the conversion from liquid into jelly, by cooling, of a solution of gelatine, contained in a small vessel, together with a compass needle and a plumb-bob, and of such a shape as to align itself with any part of the hole in which it may be placed. Another instrument takes a photographic record of the position of the compass needle and plumb-bob, after the lapse of such an interval of time as is necessary to place the instrument in proper position and allow the needle and plumb-bob to come to rest. The position of points in any plane stratum, as found by three bore-holes, determines it. If, however, the angle at which a bore-hole cuts this stratum is known, only two bore-holes are necessary, and if the strike and dip of the stratum is known, one bore-hole is sufficient to determine it.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Amalgamation of Copper Ore.

The Editor:

Sir — Although other metallurgical processes have of late taken precedence, there can be no doubt that for many isolated mines, and certain classes of silver ore, the amalgamation process deserves consideration. It may be that an account of my experience will be of service to a brother in the profession. Of literature and theories on the amalgamation of raw silver ore, there is more than can be mastered by a single individual in a lifetime, but with the exception of B. Kroehnke's recent valuable treatise on his process, I do not know of anything which has proved a reliable guide in practical work, and the process has been conducted by empirical routine or experimental practice for centuries, in the same way as other industries, like tanning, baking, brewing, etc. "The remarkable thing being that results were obtained without any positive comprehension of the chemical processes involved and that one has been able to conduct these as if one had been, in part, conscious of the single reactions." How little even the engineering profession understood the process is proved by the fact that coppery low-grade amalgam has been, and is still, frequently considered a bug-bear; at the Comstock, for instance, complicated processes have been devised to dispose of it, when actually in it, they had in hand the most potent agent for the raw amalgamation of silver ore—as will appear from the following. But to come to my proposition.

The ore deposit here is a shear-zone in porphyritic rock occurring along a contact with trachyte; it consists of an irregular network of crevices and seams between the much shattered and shaken-up fragments of, in parts, very decomposed and kaolinized rock. The original silver-bearing ore of the vein, a high-grade gray copper (*fahlerz* or tetrahedrite) containing about 5% pure silver and 30% copper, was in great part turned into an earthy friable product of decomposition, carrying chloride, of a yellowish-green color, and containing frequently a kernel of undecomposed gray copper, so that the sulphide and the decomposed portion of the ore occur largely intimately mixed.

The ore was treated by the Freiberg amalgamation process. In the chloridizing roasting of the silver, volatilization was enormous, about 35% — and this at high or low temperature, long or short duration of process, and whether the salt was added at a later stage of roasting, or originally charged with the ore. Even the introduction of expert roaster hands from the States did not materially change the result. The operation was conducted in 1,000-lb. charges in small hand-roasters, with pine wood as fuel. The chlorination would remain incomplete (85%), and the amalgam resulting was low-grade — nearly half copper. When the roasting was carried far enough to decompose the copper chloride, the silver volatilization would rise to over 50 per cent.

The following scheme, an adaptation of the Kroehnke process, was adopted, with favorable results: The fresh sulphide ore was separated from the decomposed ore by hand sorting, as far as practicable, and then crushed separately in the mill. The decomposed portion passed over concentrating tables (Wilfley) before it reached the settling vat, to extract from it all the sulphide it contained. This concentrate, together with the hand-sorted gray copper ore (representing together about one-fourth to one-third of the entire ore output) were subjected to a chloridizing roast at a low temperature, with the object not to decompose, but to preserve, the cupric chloride. It gave, after reduction with scrap iron in the barrels, an amalgam containing about four times as much copper as silver. This amalgam was utilized, and at the same time refined, in the treatment — by raw amalgamation — of the decomposed or free-milling ore. This ore was charged with 10% of roasted ore (to insure beyond doubt the presence of silver chloride) and 3½ to 5% salt into barrels, sufficient hot water being added to give it the consistency of mortar; then a certain quantity of the coppery amalgam (dissolved in a few bottles of quicksilver) was added, the amount of it being gauged so that the amalgam produced, when the barrel was discharged, would result in a metal about 900 fine.

The following reactions take place: The metallic copper in the amalgam reduces the silver chloride in the charge, with formation of cuprous chloride, thus:

$$AgCl + Cu = CuCl + Ag.$$

The cuprous chloride, dissolved in the strong hot brine, acts on the silver sulphide in the charge, with formation of insoluble cuprous sulphide and silver chloride, soluble in the hot brine, thus:

$$Cu_2Cl_2 + Ag_2S = Cu_2S + 2AgCl.$$

This newly created silver chloride is again reduced by the finely distributed metallic copper and becomes a substitute for it, dissolving in the quicksilver, with the formation of a new quantity of cuprous chloride — according to the first reaction given — until finally almost the entire copper content of the amalgam used has been replaced by the silver extracted from the charge.

It is not difficult to gauge the quantity of coppery amalgam necessary. By retorting a small average sample and deducting from the weight of the retort the silver resulting, the copper is determined with sufficient accuracy to base a calculation as to how many ounces of copper are introduced into the barrel charge by the addition of a certain amount of coppery amalgam. We know the number of ounces of silver in the charge; one-tenth of this we require in copper to remain with the resulting bullion. The quantity of copper necessary for the reactions of the amalgamation process can easily be determined by a laboratory test of a few hundred grams of ore in a bottle, or by adding an evident excess of copper-amalgam to the first barrels of a new lot of ore, when only a part of the copper contained in the charge will be consumed, and the resulting amalgam will yet be high in copper, but will indicate how many ounces of copper the process requires. The coppery amalgam resulting from this experimental charge can easily be refined by adding it to a subsequent charge, in which the copper is sufficiently reduced so that this excess of copper in the added amalgam must be consumed. According to the formula

$$Cu_2Cl_2 + Ag_2S = Cu_2S + 2AgCl$$

in which the copper is eliminated in the inert condition of cuprous sulphide, copper would be required only in the proportion of the atomic weights, or 63.3 parts of copper for 107.6 parts of silver present — and the same according to the formula referring to the reduction of the silver-chloride by metallic copper. On account of the excess of about 10% copper that we wish to leave in the resulting bullion and by reason of a number of other reactions, we are compelled to add more copper. The presence of manganese peroxide, for instance, destroys the cuprous chloride according to the formula

$$MnO_2 + Cu_2Cl_2 = MnO + CuO + CuCl_2$$

under formation of cupric chloride, which violently attacks the fine quicksilver globules, distributed through the charge, coating them with an insoluble film of calo-

mel, which prevents them from uniting again and causes great loss. This can be prevented by the addition of pulverized limestone, $CaCO_3$, to the charge, if there be no calcite in the ore which will precipitate the cupric chloride as inert carbonate of copper; still, for each atom of manganese present in the ore charge as peroxide, two atoms of copper in the shape of cupric chloride have been destroyed, and this loss of copper must be provided for by an additional amount of coppery amalgam originally added to the charge. Certain iron salts seem to act in a similar way.

Consequently, it is advisable to crush the ore in large lots, well mixed, so that after the amount of copper necessary has been determined in the first few barrels, the treatment for the entire lot is definitely known. The advantages of this method of working are evident: Roasting is reduced to less than one-third of the former amount, being restricted solely to the sulphide. The high silver losses by volatilization are avoided; these had been due to the roasting of the natural chlorides in the decomposed ores in the presence of sulphide and sulph-antimonide. The quicksilver in the barrel charge is completely protected against being attacked and powdered by chlorination, through the stronger electro-positive copper dissolved in it and present up to the end of the amalgamation reactions. The end is easily determined by examining the physical characteristics of a sample of the amalgam, washed from a spoonful taken out of the charge. When sufficient copper had been added originally and this has been substituted by silver, the ore is extracted and the amalgam becomes reasonably pure.

It would seem that in the Washoe pan process the high-priced copper sulphate added must form — with the salt — cupric chloride, which, reduced by attacking the generally very costly (at the mines) iron castings, gives a corresponding amount of expensive copper-amalgam, to which the reaction of the process is partly due. This reaction must, however, remain incomplete, since the cuprous chloride formed by the reduction of the silver-chloride — and which is necessary for the transformation of the silver-sulphide into chloride — cannot maintain itself and fill its mission completely, but must be reduced by the iron parts of the pan to metallic copper. Hence coppery amalgam and low extraction. From this point of view amalgamation in an iron vessel appears radically at fault, and the substitution of a copper vessel or pan, which, of course, could only serve as an amalgamating and not as a grinding apparatus, would seem advisable.

ARTHUR H. KELLER.

Santa Rosa de Copan, Honduras, September 8.

What Is Slime?

The Editor:

SIR—Slime is now receiving so much attention and is so conspicuous a feature in ore treatment that there seems to be a growing disposition to designate some measure of fineness which shall define it and receive general recognition.

We know slime now as a condition of pulp that requires attention more or less different from that given to sand. In my own experience I have found that slime, as it appears to us, is not altogether a matter of extreme fineness, but the manner of creating it is also a factor. Aeration in process of crushing greatly increases the visual evidence of slime.

Many years ago I had been crushing an ore with stamps, using but little water, and the pulp went largely to slime, although a medium screen was used. Near-by a large slow-traveling Chilean mill was installed and began crushing on the same ore. Instead of screens they used float overflow, about 18 in. above the die. To my surprise, there was no evidence of slime in the vat which received the pulp, the water flowing away from it clear. In this case there was no possible contact of air with the pulp at, or after, its crushing, as the stream had but a gentle flow (without falling) from the mill to the tank. For concentration, it is plain that aeration of pulp is not desirable.

M. P. BOSS.

San Francisco, October 5.

The Best Shape for a Shaft.

The Editor:

Sir—I have followed your discussion on 'The best shape for a shaft' with much interest. It is sometimes a help in matters of this kind to know what others are actually doing, and for this reason I give the following figures of work now being carrried on:

At Butte, the standard size for a hoisting compartment is four feet by four feet six inches, that means that all local cars, cages, chairs, skips, etc., are made to fit this size of shaft-compartment, and thus, if extras or renewals are needed, they can be bought to fit, and will fit. The guides are on the four-foot dimension, of course, so that these usually take off four inches on each side, leaving the hoist-compartments each 40 in. in the clear, by 54 inches. I am at present sinking two shafts at Butte, each of three compartments; one has two standard compartments and a pump and manway four feet six by five feet, the other and newer shaft is standard in hoisting section but has a pump compartment 4 ft. 6 in. by 7 ft. in the clear. The last dimension we consider ample for pumps to handle up to 1,200 or 1,500 gal. of water per minute, and also for what is locally known as a 'chippy' cage, that is a smaller cage actuated by small engine on the surface and devoted to the uses of the pumpmen, for handling pipe, pumps, and all incidental work, such as the foremen and shift-bosses in their rounds, thus relieving the main hoisting engines of much petty work. This shaft is timbered with 12 by 12 in. Oregon pine, and the compartments are separated by 10 by 14 in. timbers which carry the guides for the cages and skips.

From the figures quoted it is seen that the outside dimensions of the hole necessary to contain these timbers is 18 ft. 8 in. by 6 ft. 6 in., and of course such a shaft when broken will be nearly 20 feet by seven feet. We expect to carry this shaft down to not less than 1,500 ft., and probably much deeper than that, and consider it ample to allow us to hoist not less than 1,000 tons per day, should we be lucky enough to have that much to hoist steadily. With the big hoisting skips in use at Butte, pockets cut below principal levels and facilities for handling materials above, there is no trouble in doing such a tonnage through this shaft.

At one of my shafts in Butte I hoisted from 600 to 900 tons in this way through such compartments, and the engine was only 18.5% of its time hoisting ore, the rest was taken up with men, timber, waste, etc., or it was standing! It is needless to state what form of shaft I would advocate.

JAS. W. NEILL.

Pasadena, September 25.

HUXLEY'S purpose in life, as he expressed it himself, was: "To promote the increase of natural knowledge and to forward the application of scientific methods of investigation to all the problems of life to the best of my ability, in the conviction that there is no alleviation for the sufferings of mankind except veracity of thought and action, and the resolute facing of the world as it is when the garment of make-believe, by which pious hands have hidden its uglier features, is stripped off."

Prospecting Dredging Ground.

Written for the MINING AND SCIENTIFIC PRESS
By D'ARCY WEATHERBE.

In considering the prospective value of dredging ground there are many conditions to be taken into account besides its actual gold content; it is like all other classes of mines in this respect. As a prominent mining engineer recently said: "Each mine is a law unto itself." Likewise each dredging scheme must be considered strictly on its own merits before deciding on the methods and machinery to be used. Failure to recognize the specific conditions affecting a property, in calculating the means and cost of working it, has entailed the loss of large amounts of money. Misrepresentation and 'salting,' too, have played an important part in dredging as in other kinds of mining. Besides the amount of gold and the manner of its distribution, the following points must not be overlooked:



Prospecting Drill and Recovery Process on the Yuba.

1. Characteristics of the gravel, as to clay, hardness, cementing, size of boulders, etc.

2. Depth to bedrock; the character and contour of the rock.

3. Permanent or variable water-level, and available water supply under head or otherwise.

4. Costs of power, labor, transportation, and supplies.

5. Another consideration, not seriously affecting dredging in the State of California, but to be taken into account in many other localities, is the climate.

The methods of determining the factors mentioned are by sinking shafts, by drilling, and by actual test with dredge. Many diverse opinions have been expressed as to the relative value of each method, but undoubtedly the most practicable is the shaft. Water, however, is a serious drawback to prospecting by shaft and therefore drilling is more common. The Keystone drill No. 3 boring a hole of six-inch diameter is generally used in the Sacramento valley and it costs about $1,700. Theoretically, provided that all of the core drilled (and no more) is recovered, 16 in. should be drilled in depth for every cubic foot of core produced. It will be found that this result varies from that obtained on the assumption that the diameter of the core is equal to the diameter of the outside of the shoe. The sand-pump is a hollow-steel cylinder 8 ft. long and 4 in. diam., with a valve at the bottom and a closely fitting plunger; on each side, near the top, it has an oval orifice to allow the pulp to be washed out. There are several methods of treatment, and the general practice is the same though the methods of keeping records and estimating results differ slightly. The apparatus used includes a sluice-box, 16 by 12 in. and 10 ft. long, with holes at the lower end for allowing flow into a four compartment settling-tank, another settling-tank, and an ordinary rocker with several pans and tubs. A bucket is placed in the sluice and the contents of the pump are washed into this, each foot being treated separately. The overflow runs off into the settling-tank. The content of the bucket is panned into a tub. The number and size of the 'colors' or particles of gold in each pan are estimated by eye and the result of each foot is noted in the log-book, the colors being classed in three sizes. The colors and black sand from each pan are kept separately; the former are segregated for each foot and then amalgamated. The gold is separated by nitric acid, washed, dried, annealed, and weighed, the resulting buttons from each hole being assayed for fineness. The surplus contents of the pannings caught in the tub are passed through the rocker, the concentrate being re-rocked. The overflow runs into another settling-tank and the contents of the two settling-tanks are roughly dried and measured, the computed yardage being thus checked.

Another method is as follows: The material from the hand-pump is received in a pan held in a sluice-trough similar to that mentioned above. The slime is allowed to flow away and the coarsest material is panned off in the tank. The finer portion of the material in the pan is panned over a large metal tub. The estimation of 'colors' is made in the usual manner, and everything in tub and trough is then passed over a rocker.

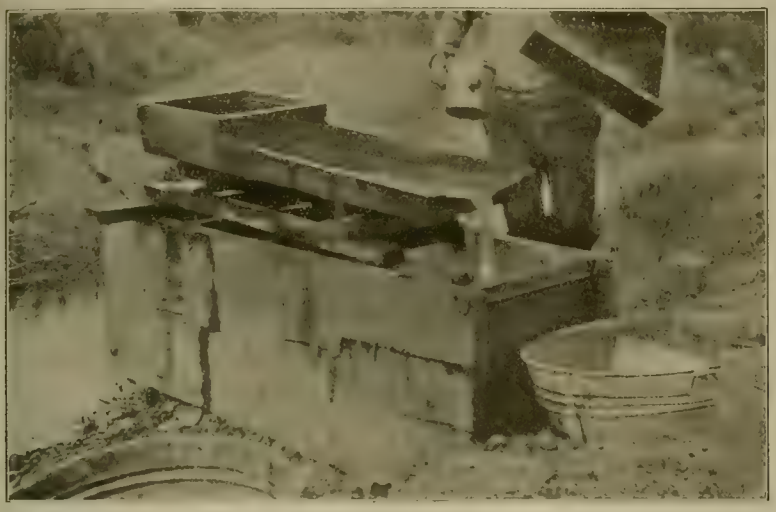
Often the rich material in the interstices of the bedrock or a rich seam will continue to be pumped into the hole, giving higher pannings than are warranted. To prevent this, when within a foot or so of the bottom, the results are panned as usual and from the foot just above and below bedrock the concentrate is caught in separate pans and if the results appear unduly high they are disregarded. All this is noted in the log-book, as well as the character and amount of gold content, other particulars relating to the character of the gravel.

In one instance I observed an ingenious method of preventing salting. The work was being done on single shift, and on leaving for the night two panfuls of *barren* tailing were dropped down the hole. The heavy bit with rope attached was then lowered into the hole and the iron blocks were put on. To move these it would have been necessary to re-fire the boiler. In the morning the blocks were removed and the rope and bit washed into the hole and pounded to knock off any 'salt' (gold flakes) that might have adhered to them on being dropped down. The pans and sluice, etc., were thoroughly washed and the barren tailing at the bottom was tested. It might be a safer plan to keep a watchman on the spot.

A clever case of salting the drillings occurred recently at Oroville. The 'salter' mixed some finely divided gold with pipe-clay; he became so adroit that he could mark a piece of casing on the inside so that the streak would

contain a given number of cents per cubic yard to be drilled. In case the driller noticed the marks at all, he would simply think that they were initials or shop numbers, and during the process of drilling, the streak with its fine gold was washed into the pump and unwittingly recovered with the gold in the gravel.

In connection with salting, several cases were related where the drillers wilfully produced (at the instance of their employer, it is said) misleading records by the following method: The bulk of the gold content was known to lie in a stratum three feet thick and between 17 and 21 ft. from surface; each hole was drilled to about 30 ft., or 10 ft. deeper than was necessary. To illustrate the result we will assume that each of the three feet between 17 and 21 ft. contained 60c. per cu. yd. and the cost of drilling was seven cents. Thus the whole ground necessary to be dredged (20 ft. deep) would average nine cents per yard, leaving a profit of three cents per yard worked. The crafty party who attempted to wreck the negotiations for a fair sale, handed in his report, giving the depth of the ground as 30 ft., and the average yield per yard as six cents. Taking the vendor's admitted cost of working (seven cents), there was an apparent loss of one cent per yard; and so the sale was declared off.



Rocker and Second Settling Vat at Central Dredging Company's Drilling Plant.

A great deal has been said about the extreme care necessary in making estimates from drill-records. At the best, the method is but an approximation and the accuracy with which it is done should bear an exact ratio to the care taken in measuring the bank and calculating the cubic content dredged each month; otherwise, the results are not only misleading, but useless.

As to the number of holes necessary to test the ground, this also is arbitrary. If the gold is known to be evenly distributed, the tract should be divided into five to ten acre squares. A flag at the centres of these marks the site of the hole. If the gold is in narrowing or widening channels, the ground should be first crossed by series of holes at long intervals and then closer together if favorable results are indicated.

The cost of drilling differs with the conditions, but it may be said that the price per foot will vary between $1 and $3.75 per foot—a wide range. In one case at Oroville 13 holes were put down at a cost of $3.18 per ft., and in the same district at another property seven holes cost $2.40 per ft. Some contract work at Oroville was done for $2.50 per ft. The following recent examples of costs and speed cover a large area, and will give a practical idea of the variation: On the Yuba, five holes were drilled to an average depth of 93 ft. at an average cost of $3.85 per ft. The work was done during the winter rains and the roads were extremely heavy—freighting was difficult, transportation charges excessive, and there was great delay in having repairs made at Marysville (the nearest point), the fixed charges having to be sustained all the time. Moreover the work had to be finished within a time limit, so as to secure results before an option on the property expired.

In the southern part of the Oroville district 50 holes were put down averaging 35 ft. each and two drills were employed working simultaneously. The cost in this case averaged the extremely low price of 97c. per ft. The work was done in summer and all conditions, including soft ground, were most favorable. Water was close at hand and the fact that both drills ran under the same management reduced expenses. The labor included 1 foreman, 2 drillers, 2 helpers, 1 panner, 1 two-horse team and 1 teamster; the last also acted as water carrier.



Delivery Vat, First Settling Vat, and Sand-Pump.

At Oroville nine holes were put down about June, 1904, and totaled 258 ft. in depth. One machine was used on single shift and 33 days were employed in the work with four days more for moving.

With regard to the ratio of recovery between dredging and drilling much, of course, depends on the method and care employed, the relative efficiency of the gold-saving appliances and the manner in which the clean-up is accomplished. Most experienced operators contend that

however carefully the operation is carried out (within the practical economic limits) and using the best of gold-saving appliances the results by drilling can never approximate the work of sampling and estimating an orebody underground. It might be supposed that by using an arbitrary method of (over or under) estimating the drilling results, a fair idea of the probable recoverable value might be arrived at and if the results bore a consistent relation (greater or less) to the recovery, this would be an effective method, but such is unfortunately not the case in practice. The ratios are quite irregular and results vary both above and below the returns from prospecting. Only one general rule seems to hold, and its application is found to be generally true, namely, that when very high results—70c. to $3 say—are got by drill, the recovery from that place is sure to be lower. Likewise it is true in practice, that ground giving very low results from the drill, say from 1 to 5 or 6c., generally dredges considerably higher. Some experienced operators go so far as to say that drilling is practically useless except as a means of ascertaining whether gold is actually present in the ground or not. On the other hand at Folsom, where several thousand holes have been put down and the most careful records kept, it is asserted positively that an average approximating about 90% of the gold shown by drilling has consistently been obtained in dredging. Be that as it may, when it is explained that roughly a drill-sample will only represent something like $\frac{1}{200,000}$ to $\frac{1}{1,000,000}$ of the body of material to be worked while in sampling a mine probably from $\frac{1}{2,500}$ to $\frac{1}{10,000}$ is taken of the orebody (which is not, as a rule, less homogeneous than the gravel beds), there should be at least a proportionate difference in the working results. Moreover, the method of estimation and selection cannot be compared for accuracy. The following authentic cases are extremely interesting in this connection: In front of the Boston and California dredge No. 1, 22 holes were put down in one acre, and the results showed that the ground contained 60c. per cu. yd. When this particular acre was dredged, just 30c. per cu. yd. was recovered. In another instance, 25 holes were put down on one acre and the dredge recovered 95% of the estimated amount. On the Delancy tract, the results of dredging recovery came very close to the drill-estimate, the latter being very carefully done. Of course, the closer together the holes are put down and the more of them there are on a given tract, the closer the general result for the whole tract should come to the actual recovery; if the work is properly done, a fairly accurate idea of the value of the property may be obtained.

For the 12 months ending December, 1903, the *Biggs No. 1** dredge of the Oroville Gold Dredging & Exploration Co., Ltd., worked 474,610 cu. yd., which, according to the estimate from prospecting, should have yielded 11.40c., the total recovery averaged only 8.45c., or 76% of the prospect value. The same dredge for the following 12 months of 1904 dredged 493,150 cu. yd., which yielded 12.32c. per cu. yd., whereas the prospect value of the area worked showed from the drilling tests an average content of 16.64c. per cu. yd., in other words, a recovery was obtained of about 74% of the estimated value by drilling. The following details of the above cases show that the ratios of recovery in cases of ground dredged after one or two drillings vary greatly, while the total average for the year appears to maintain a fairly uniform relation.

In another district in the Sacramento valley for the three months of March, April, and May, 1906, a certain dredge recovered an average of 25c. per cu. yd., where prospecting by drill had only indicated 18c. per cubic yard.

Naturally, careful shaft-sinking is a more satisfactory method of testing; it ascertains both the gold contents and the nature of the ground far more efficiently and thoroughly, but the cost is sometimes prohibitive in wet ground. Otherwise it costs less than drilling. The so-called China shaft is the method usually employed and unless one has seen the work, one wonders how it was ever accomplished by hand. Probably workmen of no other nationality would do the work or, in fact, could work in such a narrow compass.

The shafts are sunk, circular in section, three feet in diameter, and the work is done by Chinamen. Two men will do from five to eight feet per day, and at Oroville the contract cost is $1 per foot. Washing and estimating content will cost about 30c. per day more. These costs are for all work above water level. Below that level special arrangements have to be made and it is often altogether impracticable because 'John' is decidedly averse to working while water is being hoisted over his head, and little is he to be blamed for his objection. In more than one case he has sunk such shafts where it is dry, to depths of 40 ft. and over. The whole area of a certain property at Oroville could have been efficiently and cheaply tested in this manner, but for some inscrutable reason drilling was resorted to after a short period. Shaft-sinking on one property at Folsom cost $1 per foot including panning, etc., and an average of nine feet per day was accomplished.

Both at Oroville and Folsom most of the ground now being worked by dredge was all worked over years ago by pan, rocker, and sluice during the early days. As the grade of the gravel got lower, the white men left and Chinamen took their places and the ground was re-worked. In the dry season it is probable that these old shafts and drifts in many places reached the present bottom as shown by the timbers and portions of wing-dams that are encountered by the dredges and drills every day—much to the operator's disgust. Although not thorough, this work was so general and the district was so carefully exploited that today it is said that ground where old workings are not found is generally poor, and actual values of 15c. per pan and over have been obtained from some of the old tailing beds. These abandoned workings, when encountered by the prospect drill-holes, however, form a menace which often vitiates entirely the result of the hole, as it is impossible to say from what amount of gravel the results are produced. The following authentic record from some recent prospect holes at Oroville show how variable is the distribution of the gold. In some cases it seems to lie in well-defined streaks and elsewhere it is disseminated through almost every foot of the ground to be worked.

*The *Biggs No. 1* is now *Exploration No. 1.*

An iron sickle, found by Belzoni under the feet of one of the sphinxes at Karnak, is deposited in the British Museum and proves that the smith's art was practiced at about 600 B. C. In 1837 a fragment of a wrought iron tool was found in blasting operations in the Great Pyramid. This piece of iron, nearly 5,000 years old, is also preserved in the British Museum. Analysis showed it to contain a small proportion of nickel; but as it also contained combined carbon it was not of meteoric origin.

The constant widening of the intellectual field has indefinitely extended the range of that especially human faculty of looking before and after, which adds to the fleeting present those old and new worlds of the past and the future, wherein men dwell the more, the higher their culture.

The Geological Distribution of Gold.

By T. A. Rickard.

*When gold was discovered at Ballarat, in Australia, there was a great rush of adventurers to the diggings. It is recorded that in November, 1851, Henry La Trobe, the first governor of the new colony of Victoria, paid an official visit to the goldfield. As he rode among the sluice-boxes and pits of the miners, he was fascinated by the glamor of the search for gold, and became keenly interested in the manner of its occurrence. Finally, finding himself talking to an old Cornishman of more than average intelligence, the Governor said: "And from where do you think the gold comes? The old miner leaned on his shovel and scratched his head, as he replied: "Where it is, there it is; and where it aint, there be I." For fifty-five years that reply has been echoed from many a prospect hole on both sides of the equator; it has been received as the last word of geological vision and the epitome of mining realization. The story is founded on fact and it is confirmed by individual experience, and yet it does but serve to emphasize the advance which has been made during half a century of investigation. The jibe at geology which makes other versions of this original incident pass current among those that seek mineral wealth, is not warranted today. We have emerged from the uncertain shadows of the dawn; geology and mining face each other now with a better understanding than in the golden age of Australian and Californian discovery.

The practical aid which geology gives is a comparatively recent development of the application of science to industry. When geology was yet an infant, looking at the world from out of the cradle of Lyell's 'Principles,' mining had already attained a venerable age. The young science offered to guide the old blind delver of the rocks and, in the effort made several childish mistakes, which are still remembered in the days of its maturity.

Sir Roderick Murchison made the chief of these blunders that at one time estranged the geologist from the miner. The story of an error made by a man of such acknowledged talent should not merely provoke derision now that we have the ampler light of a fuller day and, possessing facts which were unknown to him, can thus, as it were, write last year's almanac, but it should furnish a striking warning against confounding a coincidence with a consequence and being led thereby to frame a wide generalization upon a narrow basis. It will be remembered that in the course of his famous elaboration of the Silurian system he made a study of the Ural mountains, including the goldfields of that region, which in the first half of the last century were of far greater importance than they are now. On his return from Russia, the results of his investigations appeared in several papers, which were published during 1841 and the succeeding years. In 1844 he drew attention to the similarity existing between the gold-bearing rocks of the Urals and certain specimens from Australia, sent to him by his friend Count Strzelecki[1]. The Ural rocks were highly altered crystalline schists, while those from Australia were silicious slates. Both were of Lower Silurian age, as was proved by fossils and correlation. Murchison noted the resemblance between these rocks and remarked that the Australian specimens exhibited quartz, although no gold had as yet been found. Furthermore, he drew attention to the similarity in the trend of the Australian cordillera and his beloved Urals. He really knew nothing about the geological structure of Australia[2]; nevertheless, the analogies which he detected led him to suggest that the Blue Mountains in New South Wales might also contain gold-bearing veins. In 1846 he learned that specimens of gold ore had actually been found there, and he then advised Cornish miners to go to Australia to search for gold[3]. In the meanwhile, he had given out a statement, based on his studies in Russia, that gold would be found to be exclusively confined to the Paleozoic rocks, and especially to the Lower Silurian. Therefore, when, in 1851, it was announced that wonderful discoveries of gold had been made in Victoria amid beds of slate and sandstone belonging to this geological period, they were heralded as the confirmation of a scientific dictum, and Murchison was generally congratulated on his successful prediction. He congratulated himself. In the third edition of 'Siluria,' published in 1859, the "inductive reasoning" which led to his hypothesis is repeated, and he says: "My chief article of belief has now proved to be true—that is, that the rocks which are most auriferous are of Silurian age." The unfortunate generalization is again worded thus: "The Paleozoic accumulations * * * particularly the Lower Silurian * * * are the chief sources whence gold has been or is derived.[4]"

Australia indeed appeared to corroborate this. It was not until 1864, when the results of the work of the Geological Survey of California, under Whitney, were published, that the Silurian formation lost a pre-eminence to which it was never entitled. The gold-bearing rocks of California were found to belong to the Jurassic. Murchison's hypothesis was confounded. It was a fallacy which the later development of gold-mining districts in other parts of the globe has shattered into as many fragments as there are subdivisions of geological time.

The following tabulated statement shows at a glance that the chief goldfields of the world are scattered through

GEOLOGICAL DISTRIBUTION OF GOLD AS ILLUSTRATED BY THE PRINCIPAL MINING DISTRICTS OF THE WORLD.

Period	Rock	District	Region
Quaternary	Andesite	Monte Cristo	Washington
Tertiary	Eruptive	Cripple Creek	Colorado
Cretaceous	Sandstone	Verespatak	Transylvania
Jurassic	Amphibolite Schist	Mariposa	California
Triassic	Limestone	Raibl	Carinthia
Permian	Conglomerate	Stupna	Bohemia
Carboniferous	Shale	Gympie	Queensland
Devonian	Conglomerate	Witwatersrand	Transvaal
Silurian	Slate and Sandstone	Bendigo	Victoria
Cambrian	Slate and Quartzite	Waverley	Nova Scotia
Algonkian	Schist	Homestake	South Dakota
Archean	Granite and Schist	Lake of the Woods	Ontario

the entire sequence of geological strata, from the Archean to the Tertiary. The Lower Silurian of the Urals is now scarcely worth mentioning, the gold production of that region having dwindled to insignificance. Since Murchison's day the geographical centre of Russia's gold production has shifted steadily eastward. It was once at Ekaterinburg, in the Urals; it passed to the Yenesei, and then to the Olekma. Today the chief gold region is that which is drained by the Amoor and its tributaries. The goldfields of Victoria, in Australia, also refuse, now, to be identified any longer with Murchison's blunder, several of the best districts[5] in that colony having been developed in the Upper Silurian, as distinguished from the prevailing Lower Silurian of the first discovered gold-veins at Ballarat and Bendigo. Newer mining regions, scattered all over the globe, afford testimony which denies the supposed relation between gold-deposits and the age of the rock enclosing them. Although numerous rich districts occur in igneous formations of the Tertiary period, no important goldfield of the present day is identified with sedimentary rocks later than the Cretaceous; nevertheless, to make the testimony complete, it can be stated

*A paper read before the American Mining Congress, at Denver.

[1]'Russia in Europe and the Ural Mts.' *Trans.* Royal Geographical Society. Vol. XIV, p. 437.

[2]'Life of Sir Roderick K. Murchison,' by Archibald Geike. Vol. II p. 134.

[3]*Trans.* Royal Geographical Society of Cornwall, 1846, p. 324.

[4]'Siluria,' 3rd Edition, p. 474.

[5]For example, the Walhalla district, in Gippsland. The principal mine is the celebrated Long Tunnel, which has attained a depth of 2,300 ft. from the surface and has produced more than 23 tons of gold. The mining districts of Wood's Point, Alexandra, and Mt. Wills may also be cited.

that a conglomerate[6] of undoubted Tertiary age, covering an extensive area in southwestern Colorado, contains gold-veins, which have been mined at a profit. If eruptive rocks be included, we have the testimony of J. E. Spurr that the gold veins of Monte Cristo, in the State of Washington, occur in andesite and tonalite of Pleistocene or Quaternary age,[8] and at Steamboat Springs, Nevada, gold has been detected[9] in cracks traversing the sinter around a thermal vent; this rock can therefore be labeled Recent. The Laurentian granitoid-gneiss of western Ontario is traversed by important gold-bearing lodes[7]. Therefore, the record of the rocks, in regard to their association with the occurrence of gold, is unbroken throughout the main divisions of geological time.

If geological authorities have made blunders in the application of theories to actual mining, it is only fair to acknowledge that practical mining captains have erred no less. Their errors, like those of greater men, have also sprung from that little knowledge which is proverbially dangerous. Thus, possessing, as a rule, no wide geological training, they avoid the pitfalls awaiting them in that direction only to get mired among hasty deductions based on the recognition of the physical peculiarities of rocks. For instance, in most mining districts the idea prevails among mining men that a particular rock is favorable to the occurrence of gold and silver; this may be true indeed of any one especial locality, but I have commonly found that mining men apply their restricted experience to other, and quite dissimilar, districts by the use of sweeping generalizations which are based on such local knowledge alone. Thus, in South Africa, granite is looked upon askance as being extremely unlikely to contain profitable gold-veins, and those who have had their experience in the Transvaal are apt to be pessimists when they find themselves amid a granitic environment. In Colorado, slate and schist are not characteristic of successful mining, therefore these rocks are unfavorably regarded, while granite is accepted as a likely terrain. In California, the great gold-mining belt is in slate and schist, while on the other hand the granite of the Sierra Nevada has been less successfully explored, therefore, 'black slate' is the desired evidence of probable richness. A mining district in India was recently condemned for the reason that the prevailing rock was a hornblende schist and yet the productive Kolar goldfield is situated amid rocks of this very kind. Limestone is regarded in Colorado as the depository of enormous orebodies, such as have made Leadville and Aspen famous, but in British Columbia it is considered, by many, to suggest small and erratic occurrences of ore, much less desirable than the supposedly persistent type of vein that occupies a fault-fracture.

These generalizations have delayed the discovery of several mining regions which are now highly productive. Experienced Australian miners passed by the conglomerate lodes of the Witwatersrand because the conditions were beyond their ken, which was largely confined to the slate and sandstone of such districts as Bendigo and Ballarat. The Cornishmen who had worked successfully for tin in their native land and for gold in Victoria failed to recognize the possibilities of Broken Hill. When Cripple Creek was first visited by old mine-managers from the Gilpin and Leadville districts, an unfavorable verdict was pronounced by men who were more familiar with granite and limestone, as ore-bearing rocks, than with an intricate series of new volcanics. In the case of this, the richest gold-producing district in North America, I can vouch for the fact that the men of science proved far better prophets than those who were versed in the actual practice of mining; the latter supposed that the conditions at Cripple Creek were unique, a supposition which disregarded the fact that the larger number of the richest veins in the San Juan region, in the same State, were in a rock of almost identical age and composition, and, to go farther afield, that there were at least two foreign localities, Transylvania and New Zealand, where a similar andesite-breccia had proved to be the envelope to rich lodes of gold and silver ore.

Instances of similar blunders might be multiplied. But it is not necessary. Are they not written in the chronicles which tell the story of mining discovery the world over? Besides, it will serve no useful purpose to deal in destructive criticism only; the recital of the foregoing facts is intended to clear the ground before offering something, be it only a rough stone or two, wherewith to build a permanent structure. We have discarded the old notions that connected the occurrence of gold with any special stratigraphic horizon or a particular petrographic encasement, in other words, any one formation or any one rock; then let us ask if there be not some other generalization that avails us in the search for the metal. Is it all without rhyme or reason, is the gold as much in sea water as in syenite, in the youngest and in the oldest rock, in high mountains and in flat deserts? The answer is that the occurrence of ore depends neither on the geological age nor the petrography of a district, but upon local structural conditions and upon an eruptive activity often identified with specific periods in geological time. To come to particulars, there is plenty of evidence, which I have collected during the last ten years and which is too bulky to be offered on this occasion, that the eruptive rocks closely associated with the deposits of the precious metals in Colorado are of early Tertiary age; they are post-Cretaceous and pre-Pliocene. The close of the Cretaceous period in Colorado was one of mountain-making, it was a time of great orographic movement, that is, the main ranges of the Rocky Mountains underwent slow uplift and, in the process, their constituent strata were folded and buckled, were crushed and fractured. Accompanying this disturbance, possibly the cause of it, more probably a manifestation of deeper unrest, there came a tremendous outpouring of lava. Some of it was emitted violently from orifices so as to form volcanoes, as at Cripple Creek and Silver Cliff, some of it fell into large areas of fresh water and consolidated into nearly horizontal deposits of breccia, as in the San Juan, and another portion remained in the shape of dikes, sheets, and cores of igneous rock traversing the older formations in diverse directions and shapes, as at Leadville and in Gilpin. This epoch of volcanic ruction lasted long, it was intense during early Eocene time, and again at the close of that period, continuing into the Miocene; and as the vulcanism died out, it had its sequel in a longer era of thermal activity, that is, the volcanic heat no longer expressed itself in the explosive escape of steam and rock fragments, but was manifested in the heating of underground waters and in the quickening of their solvent action, their circulation, and the precipitation of their contents in the approach to surface. Wherever we know the age of the eruptive rocks in contact with, or related to, the occurrence of gold (and silver) in Colorado, we find them to be post-Cretaceous; sometimes we can ascertain definitively that they are Eocene or Miocene. This is true of the quartz-felsite of Leadville and Aspen, the phonolite of Cripple Creek, the andesite of Ouray and Telluride, the porphyrite of Rico, the rhyolite of Silver Cliff, Summitville, and Creede, the diorite of Ophir and

[6] The San Miguel formation of the Telluride district.

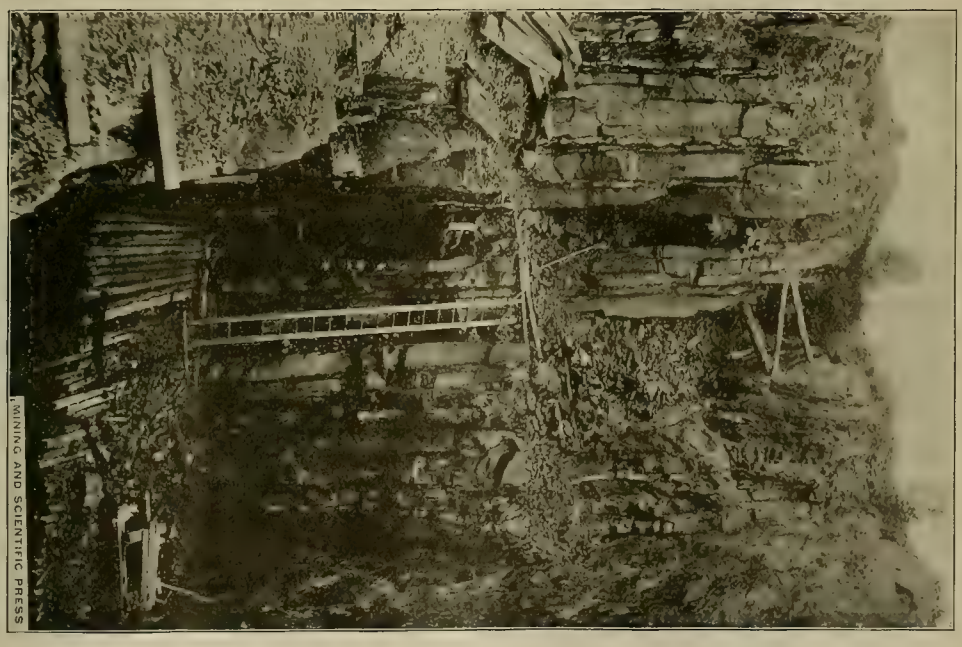
[7] For example, in the Lake of the Woods district. The Sultana mine may be instanced. It is situated near the contact of the Laurentian granitoid-gneiss and the overlying Keewatin schists, the latter being considered to be Algonkian, or intermediate between the Cambrian and the Laurentian basal complex.

[8] 'The Ore Deposits of Monte Cristo, Washington,' 1902. U. S. Geol. Sur., p. 864.

[9] By G. F. Becker.



Mining for Gold in Jurassic Rocks in California.



Mining for Gold in Cambrian Rocks in Nova Scotia.

La Plata Mts., and when we come to the mining districts in unstratified rocks, such as the granitoid gneiss of Boulder, Gilpin, and Clear Creek, we find a quartz-andesite in the localities where profitable mining is being done; and while we cannot determine the age of that intrusive, for lack of younger rocks that it penetrates, we find that it bears a close petrographic analogy to the quartz-felsite or porphyry of Leadville, which does (as at Breckenridge) penetrate the Cretaceous. I know of no eruptive affiliated with profitable gold or silver ore deposits in Colorado that is geologically older than early Tertiary. In Colorado therefore a particular period of vulcanism and its sequelæ of thermal activity are identified with the formation of the fractures and the deposition of the ore, respectively, that have given us valuable mines.

In other regions, it is likely that other periods were beneficial to the miner. It would be an old sort of blunder to conclude that the particular conditions observed in Colorado must have world-wide application. No blanket theory will do. To illustrate; in eastern Australia (in New South Wales and Queensland) the great epoch of eruptive activity was much earlier than in Colorado, namely, at the close of the Carboniferous period; that was Australia's time of mountain building, the Carboniferous strata being often found standing vertical underneath the horizontal beds of the Permian, thus constituting the greatest unconformity in Australian geology. This period is identified with the coal measures and, strange as it may seem to us in America, with gold deposition, for in many portions of the basal beds of the Permo-Carboniferous series alluvial gold is found, sometimes in such quantity as to be worth mining. The rock characteristic of this eruptive period and associated with the gold deposits of the eastern part of Australia is a granodiorite, sometimes differentiated as quartz-felsite. There is no evidence of regional eruption in eastern Austalia later than the Carboniferous; there are basic lavas belonging to late Cretaceous and early Tertiary time, but they are local and no orebodies are associated with them.* At Bendigo and Ballarat, of course, in southern Australia, we have Tertiary basaltic dikes in close association with the gold veins, but there is evidence suggesting that the original lode formation was started at the time when the neighboring granite was extruded, and that was at the close of the Silurian period and before the Devonian sediments were laid down; there is also good reason to believe that to the Tertiary vulcanism we owe the resolution and concentration of the gold in the orebodies valuable to man, in Victoria. That factor—of later mineralization and concentration—is less apparent in New South Wales, which has no goldfields comparable to Bendigo and Ballarat. In the Transvaal the conglomerate is of Devonian age, but the dikes that penetrate it and that have influenced the distribution of the profitable ore are of Tertiary age.

The subject is immensely wide—wide as the world—and it is difficult to compress an intelligent treatment of it within reasonable limits. Deposits of gold ore occur in rocks of every age and in rock of every kind. The metal was deposited later than the encasing rock and it is likely that since it was so deposited it has been subject to constant solution and precipitation, by which it has been re-distributed and concentrated. The first deposition, the time when it was brought from below the zone of rock fracture to the place of precipitation, was associated with a thermal activity following upon regional movements and volcanic eruptions; that time of first formation may have been late or early, in the Cambrian or the Cretaceous of geological history. But once so deposited, it became at once the sport of the chemical waters that find a passage both from the surface and from the deep. These may have effected no noteworthy re-distribution of the gold along the rock-fractures where the ore lies; such was the case apparently in New South Wales, for the gold deposited in Carboniferous time has not traveled far or been concentrated much. In other regions, for example in Colorado, a much later era of fracturing and vulcanism has afforded the intense thermal activity that led to the formation of new rich veins and lodes, or caused the re-distribution and concentration of the gold in older and poorer deposits.

After all, it is only the concentrations of gold that interest us as miners, there is gold everywhere, even in sea water, but what we as miners want to know is where is there ore rich enough to more than pay the cost of exploitation and extraction. The old miner scratched his head and said, "Where it is, there it is; and where it aint, there be I." The rest of us have often been where it was not and we sympathize with him, but yet not without hope, for we know some of the causes that tended to concentrate the gold in one place and to impoverish the vein in another. The world that lies underground may be dark and yet the safety lamp of science can be depended upon for some light, and as we learn how to pass the dangerous places of uncertain knowledge, we shall at last be able to use without danger the naked illumination of substantiated theory.

*To Mr. Thomas W. Edgeworth David, professor of geology in the University of Sydney, I am indebted for these facts.

DIAZ ON LABOR UNIONS.—In his message to the Mexican Congress, delivered on the afternoon of September 16, President Diaz referred to the recent trouble in Cananea and followed the reference with a statement of the attitude of the Mexican Government toward labor unions. He said: Recently there have been other movements of workingmen, principally partial strikes, the most important having been those instituted by mechanics of the Mexican Central railroad, who, in considerable numbers, abandoned various shops of the company. These movements they carried out in an entirely peaceful manner, limiting themselves to suspending work, with a view to securing the establishment of certain determined conditions by the management. Being within their rights, they have been respected by the authorities, who were directed to see that the public order was not disturbed and that other crimes were not committed, and to make known their firm intention of repressing with all energy whatever disturbances might be incited.

There has been observed on the part of the workingman a marked tendency to organize union and mutual corporations for the purpose of acquiring the strength which they consider necessary for imposing conditions on their employers. The executive is willing to recognize the right of the working classes to associate themselves, provided that they respect all legitimate interests, as much those of the capitalists as those of the workingmen themselves. If the right to refuse to work under determined conditions is respected, the right of others who may accept the conditions to work under them is no less to be respected. Both are the necessary and obligatory accompaniments of individual liberty. The executive, who is resolved to respect all rights and to preserve undisturbed the public order, hopes, from the good sense and patriotism of the capitalists and of the Mexican workmen, that each may always consider the rights of the other, a condition which will redound to their welfare and to that of the country at large.

TIN is usually found in, or in relation to, granite, especially the mica-quartz variety, called greissen. It is often pseudomorphic after feldspar.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

An action in ejectment lies to recover the possession of mine where the lease contained a clause providing for forfeiture for non-compliance by the lessee with the onditions of the lease, on proof that the conditions were roken.

Brooks *v.* Gaffin, (Mo.), 95 S. W., 418.

The owner of mining ground on a stream, having uperior rights to the use of the water, may enjoin a ower proprietor from maintaining a dam in such manner s to back the water up and thereby prevent such upper wner from discharging the debris from his mine into ie stream, thereby interfering with the operation of his ine.

Kane *v.* Littlefield, (Or.), 86 Pac., 544.

The purchaser of a mine assumed to pay certain claims s a part of the purchase price, out of the first profits eceived from the sale of ore; some ore was extracted id the mine sold. It was held that the purchaser could ot escape liability by selling the mine.

Teachenor *v.* Tibballs, (Utah), 86 Pac., 483.

The place furnished by the master for his employees ust not only be safe from such dangers as are latent, it also from such as are patent, and not alone from ose in the place, but from such extraneous matters as enace the safety of the place, and which are ascertainble on reasonable inquiry.

Williams *v.* Sleepy Hollow Min. Co., (Colo.), 86 Pac., 337.

Where the owner of a mine knew of the existence of ater in a neighboring mine in such quantity as to come dangerous to his employees, he was held bound make such investigations as would suggest themselves one using ordinary care and prudence, and if upon vestigation he learned that there was danger of the ne becoming flooded, it was then his duty to make h provisions for the safety of his employees as would ur to a person of ordinary prudence, or to inform the ployees of the danger. The standard of duty in such ses cannot be fixed by a court.

Williams *v.* Sleepy Hollow Min. Co., (Colo.), 86 Pac., 337.

An employer is always required to furnish a safe place his employees to work. But a higher degree of care required in this respect of an employer whose employees underground with scant means of escape, than in es where they are in a position to escape readily.

Williams *v.* Sleepy Hollow Min. Co., (Colo.), 86 Pac., 337.

While a miner assumes the ordinary risk of the man- in which guard rails are constructed, it was held that did not assume the risk of the negligence of another ner raising the guard rails before the cage reached the el on which he and other miners were standing, where id not appear that he knew that any one was in the it of raising the rails until the cage was in place.

n an action for the death of a miner caused by falling vn a shaft, it was held proper to prove that the rails rding the entrance to the shaft were constructed and nged differently from those intended for a similar pose in other mines in the vicinity.

Vindicator, etc., Min. Co. *v.* Firstbrook, (Colo.), 86 Pac., 313.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

Rock from Sheridan, Mont., marked D. G. D., is Chlorite and Magnetite, mixed.

Rocks from Korea, marked A. E. D., are: No. 1, Graphitic talcschist. No. 2, 4, and 5, Greenstone; No. 3, Gabbro.

White powders from Lower California, marked W. L. T., are mainly Lime Carbonate mixed with much sodium chloride and some sulphate.

Rock from Eureka, Nev., marked J. P., is so highly altered that the original character is obscured. It may have been a Rhyolite or feldspar porphyry.

Rock from Glen Ellen, Cal., marked J. H., is white Clay, presumably a decomposed volcanic tuff. It might be used with lime for cement manufacture.

Rocks from Fitting, Nev., marked W. E. C., are: No. 1, 2, and 3, locally metamorphosed rocks, allied to Hornfels and hornfelschist. No. 4 is Granite.

RADIUM.—Like any other physical theory, this one of atomic disintegration may, as observations accumulate, prove unequal to the description of new experiments; but, as matters stand, no competing explanation of the phenomena involved seems to cover and unify so wide a range of observed facts, and it will certainly not be abandoned until some other hypothesis is developed which will afford an equally intelligible and adequate model of the internal structure of the atom. The whole question is in its infancy, and much light may be expected during the next few years. Though, at the present time, the matter is of no immediate practical importance, the material interests of the race are involved in no remote degree. Our present civilization is based upon the possession of coal, and the output of mechanical power is increasing rapidly from year to year. In the not very distant future the supply of this indispensable commodity will be exhausted, and unless the human race can find some other source of energy, a relapse into barbarism seems inevitable. Recent experiments at Cambridge go to show that it may not prove wholly impossible to unlock the enormous reserves of internal energy which, on the hypothesis now under debate, are assumed to be locked up in the atom, though, in the experiments in question, this release of energy is only effected to a degree but little removed from the infinitesimal.—*Engineering.*

A RETURN-AIR PUMPING SYSTEM with a capacity of 1,000 gal. per min. has been installed by the Chattanooga Coal & Iron Co., of Chattanooga, Tenn., for obtaining its water supply from the Tennessee river. The operation of the return-air system of pumping was explained in the course of an article on 'Recent Extensions of the Employment of Compressed Air,' by Mr. Frank Richards in our issue of July 26, 1906. The pumping-plant consists of two Ingersoll-Rand Class R C air-compressors, having 16-in. stroke and 12 and 16-in. steam and air cylinders, respectively. The return-air system discharges into a series of settling tanks and thence into a cistern. The water is pumped from this cistern into a stand-pipe by a direct-acting steam-pump. These settling-tanks are necessary because the water of the river is extremely muddy. *Engineering News.*

A New Inland Sea.

The Colorado river continues to pour through the great cravasse in its bank in Mexico, ten miles below Yuma, Arizona, and is slowly filling the Salton basin, forming an inland sea. The flooding of this basin was the direct result of attempting to divert a portion of the water of the river from its natural course for the purpose of irrigating the arid land of Imperial valley. It is believed that at one time the Salton basin may have been directly connected with the Gulf of Mexico, which, at that time extended much farther northward than now. The Colorado river then emptied into the Gulf at a point far north of its present mouth, which is about latitude 31° 45' north, longitude 114° 45' west of Greenwich. Like all rivers carrying a large quantity of sediment, it built a constantly advancing delta at its mouth. The sand encroached upon the upper end of the Gulf, eventually cutting the Salton basin off from its connection with the larger body of water, and in time, the great lake thus formed, became dry by evaporation. It is known that in seasons of high water, the Colorado river overflowed into the basin, probably frequently in the early history of the lake, but in time, as the river became higher, running in a series of channels on the top of a broad plain of sand which sloped gently away from the stream for many miles, it gradually widened the barrier of detritus—at first a narrow and often interrupted sandspit—until it reached many miles into the basin, which was below the level of the sea, the successive overflows carrying the sand into the basin. These breaches in the natural levee were usually quickly filled by newly deposited sand, and the evaporation of the isolated body of water soon exceeding the inflow from the river and from other sources, the



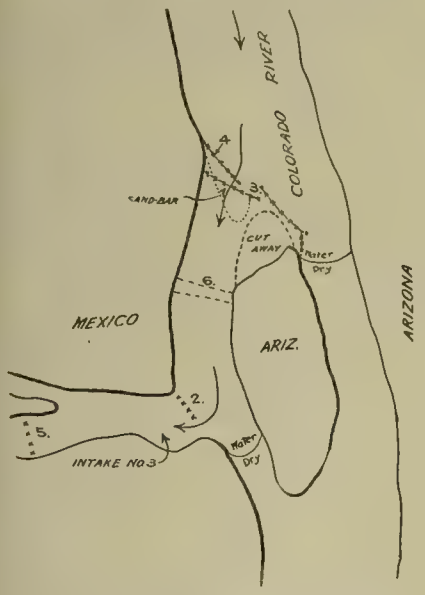
ESTIMATE OF TIME AND QUANTITIES REQUIRED TO FILL SALTON SINK TO VARIOUS LEVELS.

Present water surface*	−243	−200	−150	−100	50	Sea level.	+30
Area, sq. mi.	247	447	647	916	1,146	1,753	1,947
Area, acres	158,100	286,100	414,100	586,200	733,400	1,121,900	1,246,100
Water required† to fill section		11,771	17,505	25,007	32,280	46,382	35,520
Water required† to raise Salton level		11,771	29,276	54,281	87,274	133,656	169,176
Evaporation† per yr. using mean area of sec.		1,655	2,451	3,501	4,619	6,491	8,288
Amount of total river flow to equal evaporation, per cent.		19	31	44	59	81	105
Net water† remaining to fill section		6,500	5,500	4,500	3,700	1,600	0.0
Time required to fill section, years		1.8	3.2	5.5	10.0	20.0	
Total time required to raise surface, years		1.8	5.0	10.5	20.5	43.5	

*Elev. in ft. above mean sea-level.
†Thousands of acre-feet.
‡The evaporation would about balance the inflow when water surface reaches an elevation of 8 ft.

lake began to diminish in size, eventually becoming dry. As it dried, it deposited on the lowest part of its floor the mineral salts from saturated solutions, which could no longer retain them in suspension.

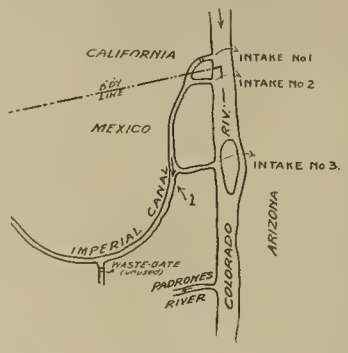
This, briefly, was the condition of the basin and the river when the attempt was first made to artificially divert the river from its course for the purpose of irrigating the farms of the Imperial plains. The first canal was too small, and the large volume of sediment carried into it by the water, caused the canal to quickly shallow, and become useless. The canal was opened at points



calculated to give a better flow and steeper grade and head-gates were put in, but as before, the silt and sand settled about the gates and in the big ditch, rendering it useless. It was then determined to dig a larger and deeper canal, but this work was accomplished during a period of low water, without apparently having considered or, at least, appreciated the possibility of a high river and its consequent results. For a time the canal was considered a success, for the heavy grade permitted a continuous flow of water to pass along its entire length to Imperial. The new portion was 3,300 ft. long, 50 ft. wide and 8 ft. deep. When the first spring rise of the river occurred, a tremendous current rushed through the artificial breach in the natural levee, rapidly cutting the channel deeper and wider. On June 1, 1905, the river was discharging a total of 61,500 ft. per sec., of which 5,360 sec. ft., or 11%, entered the canal. On June 30, with the same river volume, 13,960 sec. ft., or 22% of the total flow, went through the canal. On July 30, the canal was taking 86% of the river flow, or 15,020 out of 17,500 sec. ft. On October 25, 1905, the full river discharge, which was then 6,000 sec. ft. was going through the canal. Numerous attempts, all thus far futile, have since been made to control this stream, but the physical conditions are such as to render difficult all efforts, so long as rock foundation for restraining works is inobtainable.

With the hope of diverting some of the flow back to the gulf, a short channel was dug from the Alamo canal or river to the Padrones river not far from the Colorado and nine miles down the Alamo canal. This cut was designed to turn water into Volcano lake. A dam was built, or proposed, across the New river outlet of the lake, so the lake would discharge to the south and east, into the gulf, through an old channel called Hardy's Colorado, instead of to the northwest, through New river, into Salton sea. The result was different from that anticipated. The Padrones cut for itself a new channel north of Volcano lake, into New river, and the water found its lowest level in the Salton sink. The accompanying sketches illustrate the relative positions of the several canals connecting with the river. The relief map exhibits the topography of the entire region.

This problem has been previously referred to, and at



one time a rough calculation was made on the probable length of time that would be necessary for the river to fill the basin to a level with the river. This was estimated at 15 years, taking into consideration the evaporation. The following figures are from a report made by W. C. Hall of the United States Geological Survey. Mr. Hall surveyed the Salton basin and constructed a topographic map of it with 50 ft. contours, and with that information as a basis, he calculated the times that will probably be required to fill the basin to the various levels indicated in the table. These estimates are based on the flow of the Colorado river at Yuma, which has been determined by the observations of the past 11 years to be 8,000,000 acre-feet per annum, with an annual evaporation of seven feet. It is probable, however, that the factor of evaporation is too small.

The more recent efforts of the Southern Pacific Railroad Co., and of the company owning land in the Salton basin, to direct the river from the basin to its natural channel are said to promise greater success than heretofore, provided the river does not rise before these measures can be completed. In the event of a high river, the improvements thus far made are likely to be destroyed and the situation rendered worse than before.

The Copper Mines of the United States.

By WALTER HARVEY WEED.

*Copper mining in the United States has had a marvelously rapid development in the last ten years, showing an increase of 150% in that time. The production for 1905 broke all previous records and brought higher prices than at any time for ten years past. The greatest increase in production was in Arizona, and the greatest individual increase, that of the Copper Queen mine at Bisbee, Ariz. The following table shows the production and relative rank of the different producing States, the figures for 1904 being those prepared and published by the Geological Survey, while those for 1905 are compiled from estimates by various trustworthy authorities.

PRODUCTION OF COPPER IN THE UNITED STATES.

State or Territory.	1904. lb.	1905. lb.
Montana	298,314,804	319,179,885
Arizona	191,602,958	222,866,024
Michigan	208,309,130	218,999,753
Utah	47,062,889	51,950,789
California	28,529,023	20,000,000
Tennessee	15,211,086	14,507,982
Colorado	9,506,944	9,854,176
New Mexico	5,368,666	5,638,842
Wyoming	3,565,629	2,393,201
Alaska	2,043,586	4,703,600
Idaho	4,518,034	6,661,400
Oregon and Washington	.....	1,550,000
North Carolina	.....	700,000
Georgia	.....	10,000
Total	814,035,719	879,015,652

The copper mines of the United States yield gold and silver as by-products and many gold mines yield small amounts of copper. The total gold produced by the copper mines of the United States in 1904 was 237,116 oz., distributed as shown in the table below:

PRECIOUS METALS CONTAINED IN THE COPPER ORES OF EACH STATE.

	Gold. oz.	Silver. oz.
Utah	109,968	2,572,582
Arizona	47,563	1,464,731
Montana (Butte)	44,400	10,236,119
California (Shasta)	24,727	844,265
New Mexico	4,137	79,369
Colorado	3,288	131,695
Appalachian States (estimated)	1,066	79,600
Washington	582	16,710
Idaho	538	201,843
Wyoming	326	4,601
Oregon	326	11,677
South Dakota	145	789
Nevada	10	2,519
Michigan	.....	122,807
Total	237,116	15,768,307

The distribution of the copper mines of the country is shown on the accompanying map.

The Butte copper district is the greatest silver-producing camp of the entire world, its production being 10,236,119 oz. in 1904. Utah leads in the amount of gold produced from its copper ores, Bingham and Tintic yielding 109,968 oz., the ores also carrying 2,572,582 oz. silver. The Arizona mines yield more gold than the Butte mines, but far less silver.

The marked change from lead to copper as a collector of precious metals in smelting practice is one of the notable features of recent years, and has furnished a market for gold and silver ores whose copper content was not formerly paid for, 3% copper being long considered the minimum.

The most striking feature of copper mining in the last two years is the complete success of experiments made in the treatment of the so-called disseminated ores, in which small particles of copper sulphides occur disseminated through altered porphyry. Enormous bodies of this class of ore occur at Morenci, Ariz., at Bingham, Utah, and at Ely, Nev., which were formerly considered of too low grade to work, but which have been proved to yield a handsome profit when treated in concentrating mills and concentrated 10 to 20 into 1.

The extent to which these great bodies of 'disseminated' ore will contribute to the world's supply of copper can be estimated from the fact that preparations are being made to mine and mill 12,000 tons of this ore per day at Bingham and nearly as much at Ely, while the mills of both the companies at Morenci have been greatly enlarged. Although similar disseminations of glance and pyrite in altered granite alongside of and between the veins at Butte have long been milled, it has been customary to regard a 3% or even a 4% ore as the lowest grade that could be profitably treated, whereas at the localities mentioned above the grade is much lower, as shown by the following table, after J. P. Channing:

TENOR OF DISSEMINATED COPPER ORES.

	Per cent.
Morenci, Ariz., Arizona Copper Co.	2.6
Morenci, Ariz., Detroit Copper Co.	3.0
Bingham, Utah, Utah Copper Co.	1.9
Bingham, Utah, Boston Con. Copper Co.	1.4
Ely, Nev., Nevada Con. Copper Co., Ruth mine	2.6
Ely, Nev., Nevada Con. Copper Co., Eureka mine	2.2

It is evident that the price of the metal will determine the minimum grade of copper ore that can be treated at a profit. The above ores can be made to pay with copper at 12 cents per pound.

The widespread adoption of pyritic or raw-sulphide smelting, in which the fuel value of the sulphur is utilized, has had its effect on copper mining, as, indeed, have the introduction of labor-saving devices at the smelters and the improved mechanical arrangements which have lowered the cost of treatment and so led to the mining of lower-grade ores. The cheapened smelting costs have given a long lease of life to various old properties by enabling bodies of lean and previously unworkable ores to be reckoned as ore reserves, while pyritic smelting has led to a demand for pyritic ores as a fuel flux to be added to silicious ores. If it be true, as an eminent metallurgist has epigrammatically expressed it, that "roasting is a crime and concentration a felony," the ores now concentrated will some day be treated direct in the blast-furnace, mixed with pyritic ores, as is now being done at the Pittsmont smelter at Butte.

It has not been found practicable, nor is it especially desirable, to separate the production of milling and of smelting ores. At Butte, the smelting ores form from 6 to 10% of the total amount mined, the proportion varying at the different mines. The entire production of the Utah and of the Boston companies at Bingham, Utah, will be milling ores, and at everyone of the Arizona camps the proportion of milling ores used is increasing each year. The California ores, like those of Ducktown, Tenn., are basic sulphide ores, an ideal material for pyritic smelting.

Copper ores can be grouped commercially into smelting, concentrating, and leaching ores. All three kinds often occur at the same mine, but the distinction holds good in a general way. Smelting ores may be either pyritic, with an excess of iron, or silicious, carrying an excess of silica, though the lower-grade silicious material is often classed as concentrating ores. Pyritic ores are found at Ducktown, Tenn., and in Shasta county, Cal., while the smelting ores of Butte are well-known examples of silicious ores which need basic flux added to them to insure successful treatment.

In some cases, owing to the physical character of the ore and the minute intergrowth of ore and gangue minerals, concentration is not feasible. In such cases direct smelting with the production of a low-grade matte is possible, provided basic ores can be obtained. In any

*Abstracted from 'Contributions to Economic Geology,' 1905, United States Geological Survey.

case the loss in wet concentration is considerable, varying from 20 to 35 per cent.

In recent years self-fluxing ores have been found at a few localities—as, for example, at the Boundary Creek region in Canada and in the mines of the Saddle Mountain Co. on Gila river, Arizona—and in such cases ores particularly low in copper may be treated at a profit, provided coke can be obtained at a reasonable figure. The utilization of low-grade garnetiferous contact-metamorphic ores is still a problem for the metallurgist, and although various attempts have been made to treat such ores, particularly in the San Pedro mines in New Mexico, success has not been attained.

The Lake Superior ores may be considered ideal for concentrating, for the native metal is tough and does not slime, as do the brittle sulphides when they are pulverized to liberate their metallic content.

From a geological standpoint the producing copper deposits of the United States may be grouped as follows:

(*a*) Deposits in altered limestones, showing contact-metamorphic characters, and adjacent to eruptive rocks (Morenci type) in part characterized by deposits of group *b*.

(*b*) Deposits in fissured and altered igneous rocks, in part as veins, in part as dissemination and impregnation of shattered or porous rocks of other kinds (Morenci).

(*c*) Replacement veins in sheeted granitic rock (Butte type).

(*d*). Lenticular masses of solid, nearly pure, pyritic ore in shear zones in igneous rocks (Shasta county type).

(*e*) Lenticular deposits (similar to *d* in shape and mineral character) in metamorphic schists (Ducktown, Tenn.; Ely, Vermont).

(*f*) Deposits of native copper in altered amygdaloidal basic lava and interbedded conglomerates (Lake Superior).

(*g*) Normal fissure veins and impregnations of similar genesis.

The class first named, the contact-metamorphic deposits, yield about one-fifth of the total copper produced in this country. The allied disseminated ores yield about 50,000,000 lb., excluding Butte's production. The Michigan production of 221,000,000 lb. for 1905 is all from one type of deposit, while the lenticular deposits (*d* and *e*) yield 36,000,000 lb. The grouping given above is intended to express broad features and is not given as a satisfactory classification. Form is an important factor from the mining standpoint; mineral character of ore and of gangue from the smelter's point of view.

The first group, which for convenience may be called the Morenci type, should really include groups *a* and *b*. At each of the great mining centres—Morenci and Bisbee, Ariz.; Cananea, Mexico; Bingham, Utah, and Ely, Nev. —The distribution of the copper deposits is co-extensive with a great porphyry stock and its dike systems. Areas devoid of intrusions are barren. The lodes are essentially copper deposits, with very minor amounts of gold and silver. The workable deposits of these localities occur either in the limestones or in the porphyry. In limestone they are confined to areas showing marked contact metamorphism, and the sulphides replace the original rock material, are intergrown with the contact minerals, and were introduced during the metamorphism of the limestone. The prevalent minerals are cupriferous pyrite and chalcopyrite.



Distribution of Copper Mines of the United States.

The disseminated ores and associated fissure-vein deposits carry pyrite, with or without chalcopyrite and often with zinc-blende and molybdenite, with but little quartz gangue, in altered porphyry. The ores are low grade and in many cases workable only as far down as secondary re-concentration (enrichment) has occurred. The porphyry is altered, usually greatly so, by late hydrothermal action, in the latter case consisting of sericite, quartz, and pyrite. Where the fissures pass into other rocks alteration and ore deposition also occur, except in those already altered by contact action.

WITHIN a finite time past the earth must have been, and within a finite period of time to come the earth must again be, unfit for the habitation of man as at present constituted, unless operations have been, or are to be, performed which are impossible under the laws to which the known operations going on at present in the material world are subject.

Rope Haulage at Broken Hill.

In the Annual Report of the Department of Mines, New South Wales, there is a description of endless rope haulage, used in conveying ore from the Delprat shaft of the Broken Hill Proprietary mine to the mill. It is stated:

Delprat shaft, through which the total output of the mine is pulled, is distant from the ore-bins about 360 ft. The height of the brace above the rail over the bins is about 10 ft. Previous to the installation of endless-rope haulage, the ore was run in the mine trucks from the brace of the shaft to the ore-bins by a gravity or self-acting incline, running in trains of eight.

With a view to economy of labor, the system under description was adopted. This consists of a ⅝-in. wire rope of proper length with the ends spliced together, running continuously round two grooved pulleys eight feet in diameter, revolving horizontally. These pulleys are placed one at the shaft end and another at the mill end of the track. One is used as the driving pulley, and is actuated by an 8-h. p. steam-engine; the other is built on a carriage traveling on rails, and from the end of which suspended weights maintain a continual and regular strain on the rope, and thus automatically adjust the stretching of the rope from any cause whatever. The shaft and ore-bins are so situated that an angle of about 110° has to be negotiated. This is done with a 60-ft. radius curve, the rope being kept nearly central to the track by means of flanged vertical pulleys spaced about 8



to 10 ft. apart. On the straight, horizontal rollers 6 in. diam. and 8 in. long prevent the rope from rubbing along the ties.

The clip for attaching the truck to the rope is of simple construction, and consists of two tapered jaws of steel over which is dropped a collar or thimble, and attached to truck draw-bars by means of a ring passing through the upper end of both jaws. The rope catches in a groove or grooves, as shown on accompanying sketch.

After a truck passes over the weighbridge, which is close to the shaft, it runs by gravity on a level stretch of track about 15 ft. in length; there the hooker-on places a clip on the hook of the truck, lifts the thimble and places the jaws of the clip, one on each side of the rope, then drops the thimble. The clips immediately seize the rope, and the truck is pulled over the brow of the incline, where the strain is reversed and the truck pulls on the rope. This continues until the tangent point of the curve is reached, when the friction of the curve gradually overcomes the force of gravity, and from thence the truck is hauled by the rope. About 30 ft. from the first or No. 1 tippler, the trucks are detached from the rope automatically, and as this is at the crest of a rise the trucks—freed from the rope—gain a little speed and run into whichever tippler the points are set for.

There are four tipplers, one over each bin; these are circular frames on four rollers into which the trucks run, and at such a height that the centre of gravity of the full loaded truck is above the centre of the tippler, so that when the chairs, of which there is a set to each tippler, are withdrawn, frame and truck automatically complete one revolution, the contents of the truck being discharged as it attains the inverted position. Angle-irons, riveted to the tippler at such a height as to allow the wheels just to pass under, catch, and thus prevent the truck from falling out of the tippler. To prevent the tippler coming back on to the chairs with too great a jar, a rim-brake is attached, worked by foot.

The truck having been emptied, the next on-coming full truck bumps the empty one out of the tippler, which runs by gravity on to the empty line, where it is attached to the rope in the same manner as the full ones already described. It is now hauled by rope to the top of the incline, where it is automatically detached, and from this point runs by gravity to the back of the shaft, where the clip is taken off and placed on a conveyor actuated by the haulage rope, and by that means deposited at the point where the full trucks are hooked on ready for another trip.

The arrangement for detaching is simply a short inclined plain, with a slot running centrally along it wide enough to allow the jaws of the clip to pass through, but necessitating the thimble riding on top. The rope at this point is kept down by a depression pulley, so that when the clip enters the knock-off, the downward strain of the rope pulls the jaws down; but as the thimble cannot come down but is being gradually lifted higher on the incline, the result is that the thimble flies off and the rope is released.

The speed of the rope is about 110 ft. per min. or a mile and a quarter per hour; 200 trucks per hour are handled easily. The wear and tear on trucks is reduced to a minimum, the speed being so slow that severe bumping or spragging is unknown. The engine driving the rope is used more as a controller than a motive power, for the full trucks going down the incline pull the rope and empty trucks round. The labor saved is considerable.

A CASE of cheap hydraulic power was mentioned by Prof. K. Birkeland, of the University of Christiania, Norway, in a paper recently read before the Faraday Society at London. In describing the plant for producing nitric acid and nitrates from atmospheric nitrogen by means of his disk-shaped electric arc flame, he stated that the electric power (5,000-volt alternating current) costs the company only 25s. ($6.08) per electric horse-power-year. The cost of producing this power, he stated, is only 11s. ($2.67) per electric horse-power-year. The output of the furnaces using his process is said to be a minimum 500 kg. anhydrous nitric acid per kilowatt-year. Then at the price of 25s. per e.h.p.-yr., or 33.3s. per k.w.-yr., the power-cost per ton (1,000 kg.) of acid appears to be 67s., or with a yield of 600 kg. per k.w.-yr., it would be 55.5s. per ton. Prof. Birkeland quotes a total cost of £4 per ton of acid, so that the power-cost makes up well over half of the cost of production. The remarkably cheap power available for the process (at Notodden, Norway) is evidently the prime factor in making the process commercially applicable.

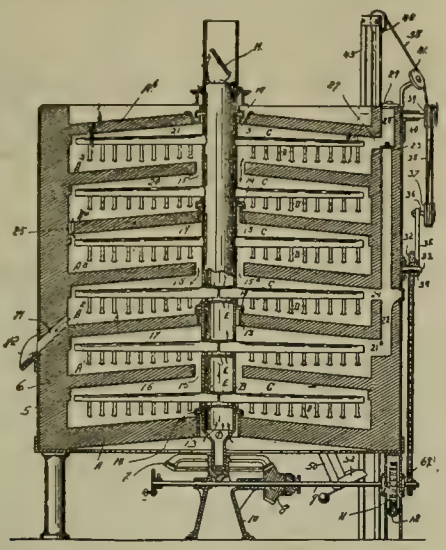
PLATINUM.—The price of platinum has been going up rapidly of late, largely as a result of disturbances in Russia, from which country practically all of the supply of that metal comes. It is now 50% higher in price than it was a year ago, selling at $28 per ounce. A year ago it sold for $18 and $18.50. The present price is three times that of 15 years ago. According to reports circulated among refiners, the Russian Minister of Commerce is now considering measures either for placing a heavy export tax on the product, or for prohibiting altogether its exportation except after it has been refined in Russia. Nearly all of the metal now exported is in the ore.—*Iron Age.*

MINING AND METALLURGICAL PATENTS.

Specially reported for the MINING AND SCIENTIFIC PRESS.

ROASTING OR OXIDIZING FURNACE.—No. 828,095; Chauncey E. Dewey, Denver, Colorado.

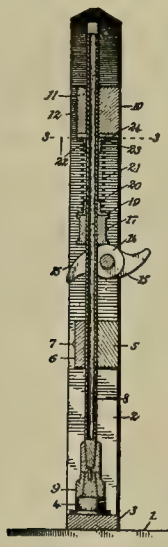
In a furnace of the class described, the combination with a centrally-located revoluble shaft and rabble-arms adapted to enter sockets with which the shaft is provided, each socket being provided with a lug, located in its lower portion and each rabble-arm being flattened on one side and



also provided with a lug, the rabble-arms being also adapted to turn in the sockets of the shaft, the lugs of the rabble-arm and socket being so arranged that by giving the arm a partial turn it may be inserted to bring its lug inside of the plane of the socket lug, whereby when the arm is turned to bring its plows into the operating position, its lug will occupy a position inside and engaging the lug of the socket to prevent the removal of the arm by a direct outward movement, and to hold plows in an upright position.

ORE STAMP-MILL.—No. 828,126; Thomas E. Lambert, Butte, Montana.

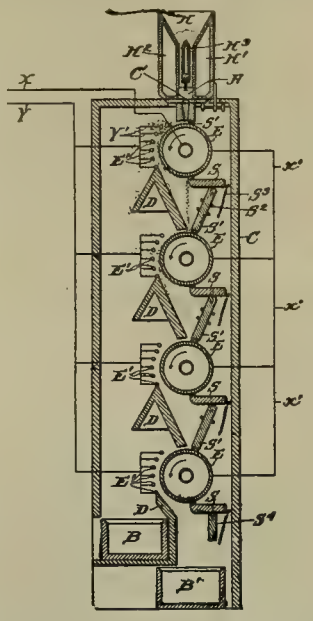
A stamp-mill, comprising one or more vertical stems, having shoes at the lower ends thereof, dies co-operating with the shoes, tappets on the stems, a shaft, and cams



thereon for engaging with the tappets, coiled springs on the stems, upper and lower guides for the stems, and means for preventing contact of the coils of the springs with said stems, embodying flanged collars upon the tappets, and similar flanged collars at the upper ends of the springs, the said collars extending within upper and lower coils of the springs.

APPARATUS FOR ELECTROSTATIC SEPARATION.—No. 827,116; Greenleaf W. Pickard, Amesbury, Massachusetts.

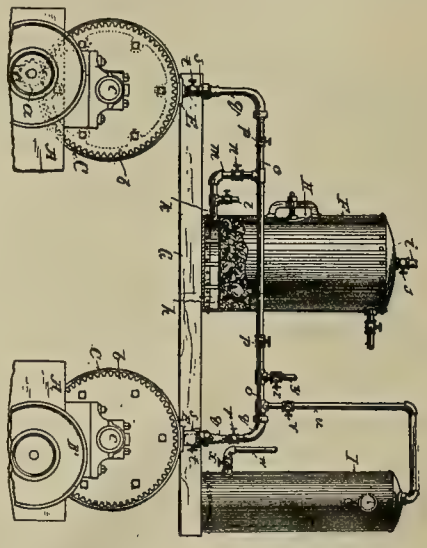
In an electrostatic separator, a source of electrical energy, electrodes, means to supply the material thereto, means to



heat the material before it reaches the electrode, and means to maintain a heated atmosphere about the electrode into contact with which the material is delivered.

APPARATUS FOR CYANIDING ORES.—No. 830,615; Thomas L. Rankin, Sackett Harbor, New York. Filed June 11, 1906. Serial No. 321,086.

In apparatus for cyaniding ores, a rotary leaching cylinder adapted to retain compressed air during the operation of leaching and means for supplying compressed air to said



cylinder, and means for rotating said cylinder in combination with a second cylinder for receiving the excess of compressed air and contained gas from said leaching-cylinder, and means for equalizing the pressure between said cylinders

Lode-Stone Picked Up by a Dredge.

Not long ago in cleaning up the wells and sluice-boxes on the Allis-Chalmers gold dredge, owned and operated by the Bonanza Basin Gold Dredging Co., in the Bonanza basin, Alaska, a perfect specimen of magnetic iron ore, or lode-stone, was found. Though worn to a rounded pebble one inch by one-half by three-quarters, the specimen retained so strong a polarity that the accompanying black sand was held attracted to it and picked up in great black ropes, thus first attracting attention to the curious substance.

Masses of iron ore in a state of magnetic polarity, constitute what are known as 'lode-stones,' or native magnets. They occur in extensive beds and are met with in granite, gneiss, mica, schist, clay-slate, syenite, hornblende, and chlorite-schist. The lode-stone was well known to the ancient Greeks. Pliny called it Magnes, from the name of the country Magnesia, a province of ancient Lydia, where it was found. Its discovery gave to science the terms 'magnet' and 'magnetism.' The first compasses were magnetized by contact with lode-stones. By a mere touch to a steel object, strong magnetism is imparted seemingly without any loss of energy in the stone itself. The existence of this curious mineral, doubted by many philosophers of old, gave rise to many a story of romance and adventure. In ancient times, kings were proud to own small specimens such as that found in the sluice-boxes and taken from the Klondike river. There is today no monetary value attached to magnetic iron ore. Steel is readily magnetized by currents of electricity for use in navigation and for scientific instruments.

The history of the process of gold dredging, by means of which the specimen above described was recovered, is interesting, as showing the trend of modern development. Though based primarily upon the recovery of a very small amount of precious metal in a comparatively large bulk of inert material, the industry has shown itself capable of being conducted at considerable profit. The comparative simplicity of the dredging operation is the main reason for this, coupled with the elimination of all labor problems; for only a few men are required to operate the machinery. Within recent years the mechanical part of the construction of dredges has been largely advanced, due regard being paid to the nature of the work which the dredge is intended to perform, with a view to making the mechanism as strong and simple as possible and adapted to the somewhat rough and difficult conditions under which many dredges have to operate. The Allis-Chalmers Co. make it their business to design and build dredges adapted for special work.

Commercial Paragraphs.

THE A. LIETZ CO., manufacturers of surveying and nautical instruments, have returned to their old location at 632-4 Commercial St., San Francisco.

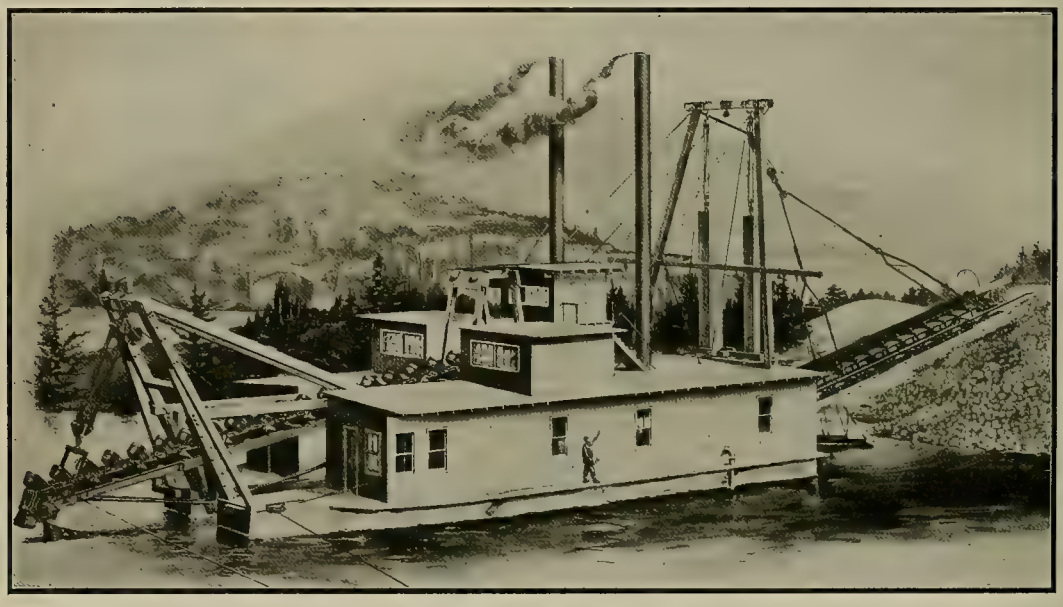
COLORADO IRON WORKS CO., of Denver, has received an order from the Tonopah-Liberty Mining Co. for a 10-stamp mill, with concentrating equipment, to be erected this fall near Tonopah, Nevada.

THE PACIFIC HIGH EXPLOSIVE CO. has a temporary office at 100 Bacon Bdg., Oakland, Cal., and the management states that it will be ready in a short time to place this product on the Western market.

INGERSOLL-RAND CO., of New York, have issued catalogue No. 45 B, giving a detailed description of their Ingersoll-Sergeant rock-drills, with tabulated specifications and capacities of each type and size, with comments on the work for which each is adapted. A list of 44 questions covering the problems of rock-drilling under all conditions is given. The book closes with several pages devoted to tables of useful information on compressed air.

P. C. MCCABE & CO., of Los Angeles, publish an attractive pamphlet describing their New Standard Concentrator. It is handsomely illustrated and gives details of this useful machine, together with an appendix containing data on the specific gravity of minerals and other information serviceable to the millman. A number of copies of testimonials from mill managers testify to the excellent work accomplished by this concentrator.

AN interesting little concentrating plant, with the heavy pieces of machinery sectionalized for mule-back transportation, was shipped recently to the Venture Corporation, at Guatemala City, by the TRAYLOR ENGINEERING CO., of New York. The plant was designed in New York and shipped with all parts complete and ready to set up. The building to enclose the plant was designed so that it could be built throughout of logs or poles. The outfit consists of a 4 by 6 ft. grizzley, a 7 by 10 in. Blake crusher, ore-gate irons, two 32-ft. bucket-elevators, two sets of 22 by 10 in. crushing rolls, one 10-in. plunger feeder for the rolls, one double unit centripact screen, one single unit centripact screen, one 24-in. sizer, one 30-in. sizer, one two-compartment Hartz jig, one one-compartment Hartz jig, one unwatering screen, two concentrating tables, one 9 by 12 in. automatic steam-engine, one 8 by 10 in. automatic steam-engine, and 24-h. p. water-tube boilers; iron-work for settling tanks, belts, shafting, and all other details necessary to make up the complete plant, and complete erecting plans were included in the shipment.



Double-Lift, Long Sluice, Gold Dredge.

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Editorial.

INSERTED LOOSELY in this issue will be found the index for Vol. XCII, covering the issues of the first six months of the current year.

THE COMPLETION of the railroad to the Bullfrog district, in southwestern Nevada, is an event of importance. The rails are now laid from Beatty to Las Vegas, on the Salt Lake & Los Angeles line, and it is certain that no time will be lost in extending this branch—the Las Vegas & Tonopah Railroad—to Goldfield. Already many carloads of machinery have been delivered by the new railroad. We congratulate the Bullfrogs on the Amargosa.

THE CONTRIBUTOR who gives us a leaf from his biography in 'The Experiences of a Tenderfoot' will awaken many memories among men now gray in professional service. We laugh with him at the simplicity of the tenderfoot—the tenderfoot that each of us was once. Every mining engineer will remember vividly his first appearance on the field of action, his preconceived notions of a mining community, his ingenuous ideas of its requirements, his first days of honorable labor. Others are going through the same experiences today, only they will not know it until twenty years hence.

MINING COMPANIES are not often generous in recognizing the value of an engineer's devotion to their interests; therefore the action of El Oro Mining & Railway Company, at the recent annual meeting at London, in voting a handsome bonus to Mr. Robert M. Raymond, the manager, and Mr. Alfred F. Main, the assistant manager, at El Oro mine, in Mexico, is an incident that it is pleasant to chronicle. We happen to have some acquaintance with the operations of the company, having visited the mines and mills at El Oro, therefore it is a pleasure to record such appreciation of good work. If the relations between the local management and the directorate at London are, in this case, unusually cordial, it is due to the fact that the latter includes several men of wide experience in mining. The sympathetic intelligence of directors that have been through the mill of experience is worth a great deal to a mine manager; in fact, it is the best help he can have—next to plenty of pay-ore.

A CORRESPONDENT writing from New York makes a protest against the common practice of erecting mills and metallurgical works without proper advice. He makes his point so well that there is no need for us to emphasize it. Naturally, the people that sell machinery are willing to give gratuitous advice as to the sort of plant the purchaser should select, because it enables them to dispose of the products of their own manufacture, just as a real-estate agent will, if consulted, recommend property

which is on his books. We do not blame them; often their suggestions are good, and it is certain that the best firms cannot afford to take unfair advantage of the simplicity of customers. But it is high time for the public to learn that to buy mines without the advice of men experienced in such matters or to erect a mill without consulting those who have made a life-study of metallurgy, is an ancient blunder, for which they will pay with undeviating certainty. So long as people make important contracts without consulting a lawyer and dose themselves with drugs without seeing a doctor, so long will they also do the other foolish things that undermine the prosperity of the mining business.

A Passing Era.

The removal of the ruins of the old Stock and Bond Exchange on Pine street takes away the last link with a bygone era — that of the bonanza days on the Comstock. Of the old building only a part of the front wall survived the earthquake-fire, and with the demolition of that remnant the survivors of the great days in Nevada have lost a landmark in San Francisco. It will require sixty days to take away the debris, and then the old rooms where Con. Virginia sold for $750 per share, California for $850, and Crown Point for $2,000 will be no more. The sentiment of the older generation deserves respect, but the fraud and the folly of the Comstock boom deserve none. Despite the tremendous yield from the big lode on Mt. Davidson, the Comstock did more harm to mining than it did good; it made the fortunes of a few and worked the ruin of many. Another era has been ushered in; as the ruins of the former exchange are carried away to fill a marsh or make a grade, the air is full of good news from the young camps in Nevada, in a region considered almost impenetrable thirty years ago. As the old giant on Mt. Davidson shrinks with age into a dishonored grave, let the youngsters take heed to avoid the chicanery and insane gambling that made the Comstock a curse. Farewell to the past; greeting to the present. May the records of Tonopah, Goldfield, and the whole galaxy of mineral districts on the western border of Nevada make history as Virginia City did, but let them not duplicate her dishonesty, nor be sullied by her shame.

Taxation of Timber.

It appears that, by a reciprocal arrangement of the tariff in New Zealand and Australia, the import duty on mining timber is to be trebled, the idea being to encourage the use of the native product in place of oregon pine. New Zealand is responsible for this latest development of tariff eccentricity, although it seems unlikely that the kauri can be used in mining. Australia produces excellent timber for special purposes, such as railroad ties and block pavements, but the native woods are too heavy, brittle, and short-grained for employment underground. At Broken Hill, the additional expense to be incurred by reason of this tax on oregon pine will amount to a large sum, and at other centres in Australia the cost of timbering will be needlessly increased; and to little purpose, for it is unlikely that the intention of the impost — to encourage the use of the native woods — will be achieved. In the meanwhile the great demand for lumber in rebuilding San Francisco will cause us to smile at this Australian taxation. There is use for all the oregon pine that is obtainable. The price of lumber has risen from $13 to $30 per thousand feet, and the inadequacy of the supply even at these artificial prices established by greedy companies, eager to make money at the expense of a stricken community, is apparent throughout the cities of the Pacific Coast. There is plenty of use for American timber and lumber much nearer home than Australia. It is better used in the homes of our people than consumed in supporting holes in the ground on the other side of the equator.

The Mining Congress.

Another annual session of the American Mining Congress has been held and it must be allowed that it was a useful gathering, likely to further the best interests of the industry to which it is dedicated. The Congress has not made much headway during recent years; it is true that it was rescued from disgrace and it has been properly organized, but the support expected from the mining community has not been accorded in anything like full measure. Nevertheless, the earnest efforts of a few public-spirited men are beginning to have their effect and it would give us much pleasure to see the Congress develop into a useful institution. At all events, we recognize the singleness of purpose shown throughout the last three years by the president, Mr. J. H. Richards, and we appreciate the hard work done by some of his immediate supporters. At Denver last week the local people did not evince much interest in the opening proceedings, but to the later discussions they came in goodly numbers, and when the Congress took in hand such subjects as fraud in mining, drainage districts, and smelter settlements, the attendance was creditable, in quality as well as quantity. When thoughtful men like D. W. Brunton, Franklin Guiterman, W. R. Ingalls, R. L. Herrick, and our own governor, Mr. George C. Pardee, take a hand, it is obvious that something useful is likely to be evolved. Of course there were some queer people who made themselves prominent and there were others who made aimless speeches, but the gathering would not have been representative without them, and communities need safety-valves. That beneficial work was done there is no gainsaying, and that the Congress made a distinct step forward was obvious to the fair-minded. We wish it further success, whether it be under the leadership of the good citizen from Idaho, or whether he passes the gavel to Mr. Thomas F. Walsh or Mr. John Dern, both of whom are mentioned for the presidency. We need an occasion to foregather, a sort of rallying ground for men of ideas, a coming together of those with a purpose, and a talking mill for concentrating public opinion. Some such parliament of mining men is destined to play an important part in the ethics, the legislative control, and the financial methods applied to the great industry to which we are devoted. We look to the Mining Congress to fulfill that ideal.

By the Way.

At the recent session of the American Mining Congress, a paper was presented by Dr. R. W. Raymond on the history of the American Institute of Mining Engineers. He said:

The period following the war for the Union was characterized by great activity in mining, and a great demand for mining engineers. The mining industry of the Pacific States had been, ever since the discovery of gold in California, the leading factor in the settlement of the country, the improvement of communications and the establishment of civilized communities, with auxiliary agencies of commerce and manufactures, as well as education and religion. The governmental aid given to the Pacific railways, on the ground that these lines were military necessities for the handling of the Indian tribes and the maintenance of sovereign Federal authority throughout the vast Pacific slope, could scarcely have been secured, had not the mineral resources of that region given it a thrilling romantic interest and a boundless value in the eyes of the people of the East. At the same time, the exploitation of the western mines and the rapid development of coal, iron, copper, and lead mining in the older States, called for trained engineers; and successive technical schools were established in response to this demand, while technical journals flourished, and became more and more devoted to problems of theory and practice, as well as records of new enterprises. Meanwhile, the actual mining engineers of the United States—those who were doing the great work of mining both East and West—could not be said to form an organized profession at all. There were a few graduates of foreign schools, many civil engineers who had turned their attention to mining; a much larger number of miners from Cornwall or Germany who had risen to be mine-captains and experts; and a still larger number of self-taught American miners and prospectors, ignorant and jealous of book-knowledge, and over-conscious of superiority in many respects to its possessors and professors. This heterogenous multitude had no common ground for the interchange of views and experiences, and no organized common feeling inducing them to seek and occupy such a ground. The technical journals and the technical schools alike needed to be reinforced in their endeavors by some agency which should promote personal acquaintance and mutual esteem among the men in whose hands were the mining operations of America.

It was my realization of this feature of the situation that led me, as the editor of *The Engineering & Mining Journal*, to attend at Wilkes-Barre, in May, 1871, the meeting called by three mining engineers, Eckley B. Coxe, Richard P. Rothwell, and Martin Coryell, to organize an association. As a beginning, in default of a duly elaborated scheme to suit our special case, the rules of the North of England Institute of Mining Engineers were adopted in substance, and the name of 'The American Institute of Mining Engineers' was chosen for the new society without debate, as a matter of course. The rules were subsequently re-written; but the name, though in some respects a misnomer, since it does not fully describe the scope of the Institute, has survived, and has become so dear to the members and so well-known to the world that it is not likely to be changed.

At the outset, a most important question arose, the settlement of which involved the whole future of the society. Several educated engineers protested against the admission to full membership of persons not belonging to the profession, and not possessed of a certain degree of professional standing and experience. They could not insist upon the degree of M. E. or E. M. as a qualification. They did not themselves hold that degree; but they felt that C. E., or its equivalent in certified experience and knowledge, ought to be required. In a word, they did not wish to recognize as fellow-members (though they would consent to admit as associates), common miners, foremen, and self-educated mine captains.

There was much to be said in favor of this feeling. Professional societies usually represent professions, and membership in them is accepted as a guaranty of professional standing. Consequently, they make careful preliminary examination into the training and achievements of candidates, and sometimes impose a period of quasi-probation as 'junior' before advancement to full membership. All this is excellent, for the purpose for which it was designed. But that was not the purpose of the Wilkes-Barre meeting of 1871; and if that had been its purpose, the movement would have failed. This point is so important as to warrant further explanation.

There was at that time no such thing in the country as a distinct profession of mine-engineering, numerous enough to support an active and useful society. Any attempt to create one by means of a society would have resulted in a small, select (i.e. self-selected) coterie, barren of influence and outside of practical connection with the national mining industry.

The pressing need of the hour was not the segregation of a select body, but the cordial co-operation of all the representatives of a great industry or group of industries. This could only be effected by bringing together on terms of friendly equality the school-men and the field-men, and persuading the latter to do what they were naturally shy and reluctant in attempting, namely, to tell what they knew, for the benefit of all. Unquestionably the self-educated practical mining men and furnace-men at that time knew more than the school-graduates about the actual facts of American ore deposits, mine-workings, and furnace management. It was not the nominal manager but the Cornish captain who knew the mine; it was not the chemist but the founder who ran the furnace. If these practical men were slighted at the beginning, they would stand aloof, giving no aid in the way of fresh facts, and leaving the theorists to exchange their speculations with little profit, like the traditional boys confined in the garret, who professed to have made money by swapping jack-knives, back and forth.

Again, the work of publishing and distributing useful information could only be done upon an influential scale by a society with a large income; and this would require either a select, small society supported by heavy annual dues, or a numerous membership paying small dues. Beyond question, the latter was both easier to secure and more fruitful of influence as well as revenue. The result of thirty-five years' experience has left no doubt on that head. What the Institute has given to its members in the way of publications for the annual fee of $10 may be confidently compared in both quantity and quality with the similar publications of any society in the world, supported by annual dues of twice or thrice that sum.

Another point is worthy of note. A large membership, even if it be not narrowly confined to men of a certain ascertained standing in a single profession, furnishes an attractive and inspiring public to ambitious authors. A famous engineer (member of several other American and foreign professional societies, as well as of our Institute), once said to me: "The Institute is an association largely composed of young men with reputations to win, instead of older men with reputations to maintain. The consequence is, that your members are eager to communicate what they know or think, instead of being afraid to 'give it away,' or reluctant to incur criticism by offering professional contributions not monumentally complete and creditable to their acknowledged professional standing."

Special Correspondence.

Melbourne, Australia.

Ventilation of Deep Mines.—Interesting Investigation.—Shall Tuberculous Miners be Permitted Underground?—Zinc Processes at Broken Hill.—The Half-Yearly Report of the Broken Hill Proprietary.—A Splendid Showing From the Great Mine.

The mining event of the past fortnight has been the publication of a special report by Dr. Summons on the ventilation of the deep mines at Bendigo. One of the shafts in that district goes down to a depth of 4,200 ft. and several are more than 3,000 ft. deep. The steady increase in miner's phthisis at Bendigo has been occasioning alarm, not only among the miners themselves, but to the ordinary residents. Bendigo has one of the finest climates in the world for sufferers from chest complaints—a hot, dry summer with a bracing winter—so that under normal conditions deaths from phthisis should be rare. Local medical practitioners have traced the spread of the disease to the undermining of the system by fibrosis due to the inhalation of the dust in the mine workings; also to the defective ventilation. To carry the investigation further, the trustees of the Wilson estate, constituting the larger interest in the Melbourne *Argus*, who, by the will of the testator, have to devote the profits coming to them from that paper to charitable purposes in the State of Victoria, gave a sum of money to the committee of the Bendigo hospital to defray the cost of a prolonged inquiry by a competent medical man. The hospital committee selected Dr. Walter Summons, who has spent six months up and down the mines. His experience may be summarized in the statement that in some of the workings "there was only a sheet of paper between the miner and hell." He found that in mines whose bottom workings are connected, such as Lansell's 180 and the Victoria Quartz, at a depth of over 3,000 ft. where there are upcast and downcast currents, the temperature was about 80° F., indicating that with natural ventilation under the best conditions such a temperature must be expected at that depth, owing to the heat of the rocks. In hot raises and the dead ends of cross-cuts, the heat was greater, dust was always perceptible in great quantity, and there was an undue percentage of carbonic acid gas in the atmosphere. Dr. Summons cited the case of the Suffolk mine where, by the use of the spray, the manager reduced the temperature perceptibly, and brought both the dust and CO_2 down to a limit well below what may be termed the danger point. He therefore advocates the use of the spray, as well as the air-jet, the effect of which is apparent from 30 to 100 ft. ahead of the spray. Local legislation provides for the use of the spray, but the law has not been enforced. There is no doubt that this will now be done and it is equally certain that the whole question of ventilation will be dealt with during the present session of the State Legislature. Dr. Summons also recommends that the mines be connected, the smallness of the properties favoring that step; he suggests that centre-country winze and shaft be sunk simultaneously instead of the first-named preceding the latter, and that cross-cuts be made to the winze at every 100 ft. Stated in a sentence, the report is: 1. Rely on natural ventilation where practicable. 2. Improve the working conditions in the hot raises and dead ends by the aid of cross-cuts and drifts and by the use of the spray and air-jet. The mining community has endorsed these recommendations, but it halts at the medical corollary: Stop the tuberculous workman from working underground. Dr. Summons is emphatic on this, and I see that Dr. Irvine preaches practically the same thing for the Rand. The miners say that such a drastic step will throw many families into a state of destitution, but that evil is less than the continuous infection of the mines by dangerous subjects. The Minister of Mines takes this view, for he says: "I consider the recommendation, that miners suffering from tuberculosis should not be allowed to work underground, a valuable one. If a person suffering from tuberculosis is a source of danger except under properly guarded conditions on the surface, the danger underground must be multiplied a hundred-fold." It may be added, as showing the heat in some of the deep workings, that in the Victoria Quartz cross-cut at 3,800 ft. last week, a stream of water having a heat of 113° F. was cut.

The Zinc Corporation, which was formed by Bewick, Moreing & Co. and Lionel Robinson to handle the big heaps of zinc-bearing residues at Broken Hill, has exercised one of its large options. This is the purchase of 520,000 tons of residue from the Block 10 mine, for which it has to pay 5s. per ton, equal to £130,000. Payments are to be spread over five years in quarterly installments of £6,500 each, and a deposit of £10,000 has been made to bind the bargain. The company is very reticent about how things have been going with it at Broken Hill, but outside local managers say that the company's experts are not finding the problem of dealing with the tailing as easy as expected; at all events, the company's plant on the British mine, where they were using the Potter sulphuric acid flotation process, has been shut down for some time. The trouble appears to be that the climate at Broken Hill favors rapid oxidation of the sulphides on the dump, and so the high recovery expected does not appear, as yet, to have been obtained. The Delprat process, which is a modification of the sulphuric acid process, salt cake being employed to give density to the solution, has been worked on a large scale by the Proprietary company during the past half year, 113,000 tons of tailing having been treated for about 28,250 tons of concentrate. These may be taken to average 42% zinc. The question whether the Delprat process is a modification of the Potter process is being fought out in the law courts, the Broken Hill Proprietary Co. defending the



Eastern Australia.

negative view. The case will probably take years to settle, and in the meantime something better may come along.

The Broken Hill Proprietary balance sheet for the half-year ended May 31 is just out. It may be described as a marvelous document. Work was interfered with greatly by the fire in Block 14, and despite that fact, the company's net profits for the term were £232,332, against £196,959 for the preceding half-year, when full work was done and costs were lower. This increase is partly due to the fact that the company received £14 18s. per ton for its lead, as against £12 10s. 6d. in the preceding half-year, and 2s. 8¼d. per oz. against 2s. 6¼d. per oz. for silver, but the earnings from the zinc concentrate must have helped substantially. The company's financial position is very strong, as it has a surplus of £531,447 of liquid assets over liabilities, cash reserves of £225,000, and a suspense account of £60,000 cash to safeguard against reclamations should there be any fall in the price of spelter. The following table will illustrate better than anything else the extent of the company's operations, and the state of its finances:

	Nov. 30. 1904.	May 31. 1905.	Nov. 30. 1905.	May 31. 1906.
Ore produced, tons	325,000	292,827	307,830	230,968
Output.				
Lead, tons	35,552	35,627	37,487	29,320
Silver, oz	2,561,342	2,705,929	2,896,585	2,202,361
Gold, oz	1,273	1,563	1,511	1,130
Price obtained.				
Lead, ton	£10 14s.	£11 6s. 4d.	£12 10s. 6d.	£14 18s. 0d.
Silver, oz	2s. 4½d.	2s. $5\frac{17}{64}$d.	2s. $6\frac{5}{64}$d.	2s. $8\frac{27}{64}$d.
Net profit	£136,264	£147,671	£196,959	£232,332
Do. per ton ore	£8 5s.	£9 11s.	£12 10s.	£20 2s.
Dividends	96,000	144,000	144,000	192,000
Depreciation	22,010	22,478	30,340	21,141
Reserve	125,000	150,000	150,000	200,000
Insurance fund	11,000	15,550	16,000	25,000
Surplus liquid assets	133,543	423,905	490,664	531,447

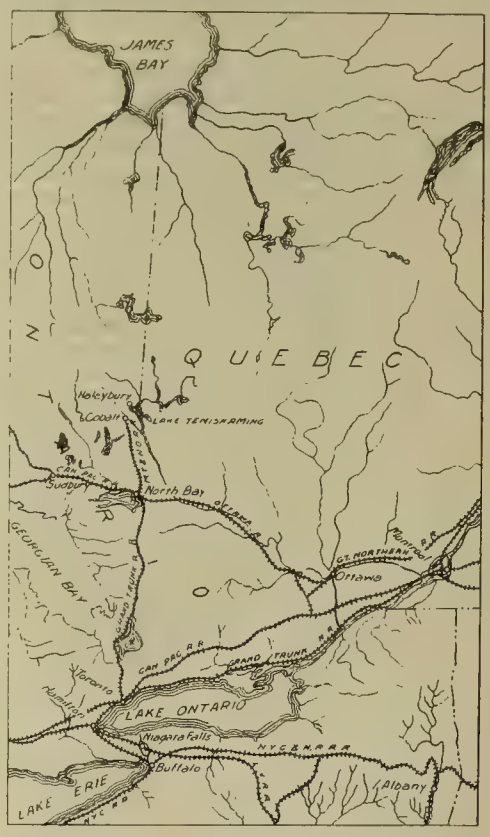
Toronto, Canada.

American Capital at Cobalt.—The Nipissing Bonanza.—Several Important Transfers.—Activity at Larder Lake.—A Copper Discovery.—Rich Ore in the Laurentian Mine.

The interest taken by American financiers and representatives of large commercial interests in Cobalt as a field for investment continues unabated, and several important transfers and amalgamations have taken place. The Cleveland Cobalt Silver Mines Co., Ltd., the promoters of which include S. W. Parsons and Frank M. Cook, of Cleveland, Ohio, has been chartered with $1,000,000 capital to operate the properties of three amalgamated concerns, the Hudson Bay Extended, the Clear Lake Mining Co., and the Clear Lake Syndicate.——The Northern Star Mining Co. has sold to the Cobalt Silver Mining Co. for $400,000 its location adjoining the Foster mine, carrying a vein of three or four inches wide of native silver. The shaft is only down a few feet, but the ore in sight is estimated at $200,000.——The Bonanza vein at the Nipissing is now strictly closed to sightseers, unless they come provided with an order from headquarters at New York. About 80 men are at work stripping and trenching at this vein and 20 miners are getting out ore. On Thursday last week ore valued at $100,000 was taken from this vein alone.

In the Portage Bay district, about six miles west of Cobalt town, the Evans property is being extensively developed, veins carrying silver and cobalt having been traced several hundred feet. One vein, rich in smaltite, has been discovered.——The McKinnon & McDougall location of 40 acres in this district, where free gold has been found, has been sold for $50,000.——A syndicate, comprising A. C. Fowler Ross, Robert Mullen, and other Montreal capitalists, has bought the Godfrey property near Gillies depot in the southern portion of the Cobalt camp, which has been for some time in litigation. They have also purchased the Powell property adjoining the White-Hargrave location, paying for the latter $60,000. John Black, a returned British Columbia miner, will have charge of their operations.——At the Huronian Cobalt, in the southwest of the camp, a gang is at work stripping so as to disclose the surface ore. A 50-ft. shaft is being put down. J. J. Anderson is in charge as superintendent.

Great activity is being shown in prospecting operations at the new Larder Lake gold camp, where many fresh prospectors are arriving. Dr. Roddick, who found free gold here last summer, has refused an offer of $75,000 for his claim, on which free gold has since been found in more than twenty places. The gold-bearing belt is from one-half to three-quarters of a mile wide. The field is nine miles from the railroad line and two days' travel by canoe from Haileybury or New Liskeard. A great rush



Map Showing Position of Cobalt and Lake Temiskaming.

is likely to take place next spring.——A valuable discovery of copper ore has been made by C. B. Duke and Dr. Campbell, two Rossland prospectors, three miles north of Bruce mines on the north shore of Lake Huron. Test pits have been sunk along the formation at intervals for a distance of three-quarters of a mile, and in all of them has been found ore of good quality.——R. B. Nickerson, who has had an extended experience in California, where he was for six years manager of the Confidence mine, has been placed in charge of operations at the Laurentian gold mine in the Manitou Lake area of northwestern Ontario. The force at this mine is still working on the rich ore of the 85-ft. level. It is claimed that the ore extends in depth from about 30 ft. below the surface to at least the 200-ft. level.——At the Golden Horn mine, Lake of the Woods district, a new Huntington mill has been installed and is now in operation.

It has a capacity of 40 tons of ore per day and is the first mill of its type introduced into that part of the country.

——F. H. Clergue, of the Lake Superior Corporation, has gone to New York to raise $1,000,000 to pay off the balance of the loan made to the company by the Ontario Government.

The Canadian Northern Railway interests are considering the establishment of large blast-furnaces and rolling mills in Toronto. They have asked the city for a 50-acre site on Ashbridge's Bay. The James Bay railway will next year be extended north to Moose mountain, where there are extensive iron deposits, 296 miles from Toronto. These are controlled by the Canadian Northern, and would be available as a source of supply.

London.

New Ventures in Cornwall.—Old Botallack to be Re-Opened.—Copper Mining in Ireland.—A Mexican Enterprise.—Deep Leads in Victoria.—The Kaffir Market.—Excessive Agency Expenses and Directors' Fees.

It appears that the Botallack mine is to be vigorously worked by a company in which the Cornish Consolidated Tin Mines, Ltd., will be the principal holders. This mine enjoyed the distinction of a visit by Her Majesty Queen Victoria in 1863. Her Majesty descended the incline shaft in a specially constructed 'gig', and in her wanderings underground went out under the bed of the Atlantic. The old mine has a good record. It is said that in one year one lode alone yielded tin to the value of £74,000. The mine has recently been inspected by several prospective members of the company to be formed, under the guidance of the manager (Mr. William Thomas), who is busily engaged in the preparation of a scheme for the working of the sett, which is considered to be a compact group of mines equal in importance to anything that is held by any one executive in the county. Another new proposition is the North Treskerby, upon which a party of local gentlemen are reported to have commenced operations. The public is not to be favored with an invitation to join until the developments warrant a general appeal. The property several years since was taken up by the late Baron Grant, who, however, did very little with it, notwithstanding the fact that he was promised considerable local support. The property is said to have a branch of the county adit running through it, giving some 35 to 40 fm. of 'backs', which, with the present price of tin, should conduce to the making of good profits. The continued boom in tin will have the effect doubtless of bringing other propositions to the front in "the delectable Duchy."

In Ireland, on the other hand, the Bonmahon Copper Mines, Ltd., is preparing to take advantage of the high price of the other metal, and Mr. Herbert T. Marks, the general manager, has been dilating on the outlook of the property. He reminded a press agent this week that from the thirties to the sixties of last century Ireland annually produced thousands of tons of copper, and the Bonmahon mines were by far the leading producers in the island. During the time it was actively worked the Bonmahon returned to its proprietors upward of £2,000,000 in copper. In 1868 this property was actually the biggest producer of the metal in the world. About 1870, with the appliances then available, the low price of copper, and certain labor difficulties, it was found difficult to work at a profit, and gradually the mines were closed down, and thus an important industry fell into decay. Mr. Marks is of the opinion that if the old company took out £2,000,000 between the surface and the 900-ft. level, the present company has an equally good chance between the 900 ft. and the 1,800-ft. levels, seeing that the orebodies are running true at depth; the Government plans show that there are at least 2,000,000 tons still existing down to the 900-ft. level, and there is no reason why they should not go twice as deep.

Some of the promised after-the-holidays prospectuses are beginning to make their appearance. With the Consul for Mexico on the advisory committee, the Barranca Mines (Mexico), Ltd., has been formed with a capital of £160,000 in 160,000 shares of £1 each, to acquire, further develop, equip, and work the gold and silver mining properties situate in the Homosillo mining district of Sonora, Mexico, and known as Consuelo, Consuelo Extension, Las Goteras, El Capitan, Combinacion, Barranquita, and Ogden. The properties have been inspected by Mr. K. Dunbar-Anderson, who was instructed by Hudson's Consolidated, Ltd. In Mr. Dunbar-Anderson's opinion the mine is sufficiently opened up to justify the immediate erection of a reduction plant capable of treating 60 tons per diem; but the directors propose for the present to ship ore to the smelter already in operation within a distance of about nine miles from the mine. Taking the value of the ore at £9.12.0 per ton, cost of mining and reduction at £1.5.8 per ton, and allowing 10% for loss in recovery, a mining profit of £7.7.2 per ton is shown. Treating 60 tons per day for 280 days in the year would, it is anticipated, give a net profit on this basis of £123,620 per annum, thereby insuring substantial dividends. Labor, he reports, is abundant and cheap, and there is ample timber for both mining and fuel. The water supply is sufficient for all requirements. Anthracite coal of a good quality is also, he says, being opened up and worked within four miles of the property by the Southern Pacific Railway Co., and can be obtained at 20s. per ton landed at the mine, thus ensuring a fuel supply at moderate rates. Mr. Dunbar-Anderson adds: "There is, in actual sight and blocked out, in the mine over 15,000 tons of ore, which will average, according to my assays, £9 12s. per ton, making a total value of £144,000. In addition, there is on the surface about 30,000 tons of payable ore, varying from 30 to 85s. per ton, which was stoped out in former times." Mr. Anderson's statement on the labor supply will create a feeling of envy in one or two other companies that might be named operating in the Sierra Madre. It might even be called in question by managers in that region who are at their wits end to obtain an adequate number of work-people of the right sort.

Another deep lead share — New Junction Deep Leads, Ltd. — has been introduced to the notice of the public. The share capital is £80,000, in 320,000 shares of 5s. each, and there are issued 100,000 shares, on which 5s. per share has been called up. There are also 80,000 fully paid-up vendors' shares and a debenture issue of £20,000. The reserve for additional working capital is 140,000 shares. The directors are Messrs. H. C. Hadfield, J. A. Stoneham, St. John Winne, and W. N. Morrison. The company owns a property of 3,218 acres, situate between and adjoining the Victorian Deep Leads and Charlotte Plains properties. A shaft has been sunk to a depth of 325 ft. and a drift put in 718 ft. toward the lead. About 600 ft. remain to be driven to reach the lead. The mine is stated to be fully equipped with pumping machinery, and owns one-fourth interest in the Deep Leads Electric Transmission Co., which gives it ample power for working all its machinery. It is believed that the pumping operations already in progress on the adjoining properties will have materially decreased the amount of water to be dealt with. Active work is stated to be in progress at the property.

The mining make-up yesterday affords the usual opportunity for lamentations on the continued stagnation in Kaffirs. According to one would-be authority the lack

of direct control by shareholders on this side is a contributing feature. The enormous amount annually disbursed in the way of fees and management expenses has also a deterrent effect on investors. For instance, taking the Randfontein report, eight subsidiaries, it is estimated, have been drawn upon for over £13,777 in agency fees (London and Paris), and not less than the enormous sum of over £68,665 for directors and auditors. Besides, on the Block A and Mynpacht, there has not been much more work than a little boring, and for this work these enormous sums are paid in fees to directors and agents. The five producing companies — Robinson, South, North Porges, and Randfontein proper — show that the directors have drawn in one single year over £29,259, and there has been paid for agencies in London and Paris in that same year over £6,364. Lord Welby, presiding at the half-yearly meeting of the Standard Bank of South Africa, dealt with another phase of the subject. While acknowledging that gold and diamonds are the two staple products of South Africa, he held the opinion that "figures lately published bring to view the excessive overcapitalization of the gold mining companies and account for the unwillingness of the public to invest."

Calumet, Michigan.

Number of Men Employed in Lake Superior Copper Mines. — Scarcity of Labor. — Exploring on the Arcadian. — Retirement of Capt. Weir. — The Shafts at the Tamarack. — Fire Under Control. — Centennial Output Increasing.

According to the annual report of the mine inspector of Houghton county, the number of men employed in the mines at present is the largest in the history of the district. During the year ended September 30, the average number employed was 16,506, an increase of 1,251 over the previous year. In Ontonagon county 1,180 men are employed. Official figures are not available for Keweenaw county, which forms the third division of the Lake Superior copper region, but it is safe to estimate the total working force in that county at 2,500, which makes the grand total over 20,000. This is by far the greatest number of men ever employed by the Lake copper mines. Strange as it may seem, however, an actual scarcity of men exists and several mines are working shorthanded. So scarce is labor that the Adventure mine, at Greenland, in Ontonagon county, has been forced to resort to advertisements in the local press, wherein notice is given that work can be furnished to 50 trammers and laborers. There is need for 1,000 more men in Houghton county mines alone. Labor is so scarce that some of the managers have been forced to put trammers on drilling machines.

The use of Lake Superior capital in Mexico, Arizona, and Montana has caused great numbers of experienced men to leave this region to accept responsible positions in the newer camps. Many experienced men from here have gone also to the Cerro de Pasco mines in Peru, where they are occupying responsible positions. Notwithstanding the fact that every year a great many excellent miners come to the Michigan mines from Cornwall, England, there is constantly a scarcity of experienced men for supervision underground. While the scarcity of labor handicaps the managers and prevents the expansion of operations in some instances, it is not without its benefits, as it is an important factor in the remarkable strength which now exists in the metal situation. Lack of men prevents some of the Lake Superior copper mining companies from making a further increase in their output, and the same is true of the Bisbee mines, Arizona. Not only in the mines here, but in other fields of work dependent upon the copper industry the shortage of labor is felt. Railroad construction in Ontonagon and Keweenaw counties is retarded. The Chicago, Milwaukee & St. Paul extension in Ontonagon is not advancing as rapidly as planned and there is need for 500 men there. The Keweenaw Copper Co., which is building the Keweenaw Central railway, has suffered from the need of laborers for several months past. The logging camps that cut timber for the mines will get out a reduced amount, because of lack of men and the high price of labor.

The sinking of No. 1 shaft at the Allouez mine has been resumed below the seventh level and the lode continues to carry excellent ore. The bottom drifts from No. 1 shaft are in good ground and the production this month will reflect the improvement. Since the extra head at the Centennial mill went into commission, the Allouez has been steadily increasing its ore shipments.

Herman Fesing, engineer of the Arcadian company is now engaged in surveying lines from the most recent disclosures of the Kearsarge amygdaloid bed on the Caldwell, Rhode Island, Tecumseh, and the Franklin Junior properties, to ascertain the approximate strike of the lode across the Arcadian's lands. Some years ago the Arcadian conducted extensive diamond-drill explorations, but when the work was discontinued there remained 1,200 ft. untested. It is possible that the Kearsarge amygdaloid traverses this portion of the property. Mr. Fesing will also ascertain the strike line of the Calumet conglomerate across the Arcadian, as that lode was not positively identified in the drill-cores.

William Weir, for several years head mining captain of the South Hecla branch of the Calumet & Hecla Mining Co., has resigned, and will retire from active duty on November 1. Capt. Weir is a member of the old school of pioneer miners who were identified with the first development of Michigan's copper resources. He entered the employ of the Calumet & Hecla in 1872.

Construction work on the Chicago, Milwaukee & St. Paul railway extension southwestward from Ontonagon is retarded by the scarcity of men. Several contractors have crews working on their portions of the contract, and 500 more men could be used. As the new line penetrates a virgin forest, a great deal of work is required. It is expected, nevertheless, to have the line completed by the time winter arrives.

After several months delay, the Tamarack Mining Co. is now able to work without difficulty in the territory tributary to No. 2 shaft, which was closed down last January because of a fire underground. The ground in the vicinity of the shaft is subjet to an enormous strain and is constantly moving to a slight extent by reason of the undermining, and this has thrown the shaft out of plumb. When the shaft was closed down about two years ago, to permit re-timbering, special provision to remedy the crushing was made by having the shaft in the rock extra large, while a timber shaft is constructed inside of this and is held vertical by means of lateral bracing. As the ground moves, this bracing is shortened or lengthened as required by the effort to keep the timber shaft straight.

No. 1 shaft of the Tamarack mine is still idle. It is unsafe to send men into it, as the fire has drawn off in that direction. This shaft does not ordinarily yield ore from the Calumet conglomerate lode, the ground in that formation tributary to it having been exhausted. It serves, however, to hoist the ore from the Osceola amygdaloid, which is reached by means of cross-cuts; consequently, the idleness of No. 1 shaft is not especially serious, although some good stopes were in operation on the amygdaloid, and it is of growing importance. The fire is burning among timbers in abandoned portions of

the mine and cannot possibly do any damage to the property beyond rendering No. 1 shaft idle. The shaft itself is separated from the zone of the fire by long crosscuts, which are not timbered, and therefore it is impossible for the fire to reach it. After the shafts had been sealed for a week, the fire in the North Kearsarge branch of the Osceola Con. mine was extinguished, and work has been progressing normally in No. 3 shaft since that time. Additional forces will be employed and every effort made to overcome the shortage in output occasioned by the shutdown. The damage in No. 1 shaft, in which the fire occurred, was not as serious as was expected and the work of repairing the opening is being rushed.

Two lowest levels in both No. 1 and No. 3 shafts of the North Kearsarge branch are provided with concrete stringers for the skip-roads, and concrete was being introduced as extensively as possible before the recent fire. But there was a great deal of filling necessary in some of the old workings through which No. 1 shaft was sunk, and even if the wooden stringers were all burned, wood will have to be put in again to a large extent because the filled rock has not had time to settle solidly enough to provide a proper bedding for the concrete.

Centennial's production should show an improvement this month, as a better grade of ore is being stamped, and shipments have been increased since the extra head at the mill went into service.

Bisbee, Arizona.

Increased Capacity for Copper Queen Smelter Under Consideration.—Shattuck-Arizona May Build Smelter.—The Cochise Development Co.

The output of copper from the Copper Queen and Calumet & Arizona smelters at Douglas for the month of September shows a steady increase. The Copper Queen production during last month was about 8,200,000 lb. copper, and at the Calumet & Arizona 3,822,000 lb. were turned out. At the Copper Queen the work on furnace No. 10 is being rushed, and it is expected that it will be concluded by January 1. There is a steady increase in the amount of custom-ore shipped to the smelter each month, and the management feels that the extensive development work now being done in various districts surrounding Bisbee will justify the further enlargement of the plant.

At the Shattuck-Arizona, preparations for increasing the output are being pushed forward, and results show that they are effective. The report from the Copper Queen smelter for September shows that the Shattuck produced nearly a million pounds of copper during the month. B. M. Pattison, the superintendent, stated that he expects to be able to show a production of 5,000,000 lb. by the first day of the new year. There will be a meeting of the board of directors of the company held in this city early in November, primarily to discuss the matter of building a smelter. It is well known that a number of the directors are in favor of the proposition. Shipments to the Copper Queen smelter are averaging a little more than 200 tons per day, and are being increased steadily. The new Allis-Chalmers hoist is being erected, and should be in operation by the end of the month.

Work at the Cochise Development Co.'s property is progressing steadily, but no important results have been obtained as yet. The shaft is being sunk, and is still in an altered limestone formation. Reports from Tombstone are encouraging. The new pumping plant is working in a satisfactory manner, and the shipments are being increased. The management of the Butte & Arizona Co., operating in the Huachuca mountains, is favorably impressed with the orebody which was exposed on the property about two weeks ago, and are now making arrangements for the sinking of a shaft. Up to the present time the only work on this property has been the driving of an adit to locate the orebody. It has been proved that the district contains copper, and the formation is almost the same as that of this district. The development of the Princeton group, which adjoins the Butte & Arizona, is progressing steadily.

Salt Lake, Utah.

Local Business.—Development of the Ohio.—Important Work at Ophir.—Improvements at the Cactus.—Heinze Is Active.—The Western Pacific Railroad. — Good Ore at Cold Springs.

The ore and bullion settlements reported by Salt Lake banks last week amounted to $801,000. During the same period 483,705 shares of stocks were sold for $183,853, as against 153,496 shares for $53,076 during the corresponding period in 1905.

It is believed here that the option held by F. Augustus Heinze on a control of the stock of the Ohio Copper Co. will be exercised. Since the option was taken, early in the year, the mine has been undergoing careful and systematic development, resulting in the opening of some extensive bodies of copper ore. The Ohio is now looked upon as being one of the really big mines of Bingham. ——The Markham Gulch Milling Co., recently organized, has the excavations for its Bingham mill nearly completed. This plant will treat ore from the Utah Apex and Utah Development mines.

The smelter of the Utah & Eastern Copper Co., at Shem City, Washington county, is treating about 40 tons of ore daily and making 7,000 lb. copper.——The Cliff Mining Co., operating at Ophir, is having some ore concentration tests made at the plant of the General Engineering Co., in Salt Lake, with the intention of constructing a mill early in 1907. A tramway is being built from the mine down to the town of Ophir. It is believed that W. A. Clark, who owns and operates the Ophir Hill mine in this camp, will build a railroad to the town of Ophir next year from St. John, a station on the main line of the San Pedro, Los Angeles & Salt Lake Railroad. The distance will be about nine miles. All but the last two miles can be built very cheaply.

The report comes from Ely, Nev., that excavations have been started for the mill and smelter to be built near there by the Nevada Consolidated and Cumberland & Ely companies.——The Newhouse Mines & Smelters Corporation, operating the Cactus copper mine in Beaver county, will install an electric hoist on the 600-ft. level of that property and sink in the orebody recently encountered. The management has also given orders for the construction of about thirty new cottages for the accommodation of a larger force of employees. Plans are on foot to develop this property upon a much larger scale than ever before attempted.

Although the Consolidated Mercur Gold Mines suffered an $8,000 loss by fire last week, the management has given out the information that there will be no falling off in this month's output. The fire destroyed the mine carpenter shop and a building containing several electric motors used underground. The main mill-building was threatened for a time.——There are persistent rumors afloat that F. Augustus Heinze will exercise an option held on the Annandale at Tintic; this mine adjoins the Centennial-Eureka. Mr. Heinze has been in Salt Lake for several days, but is keeping his movements carefully guarded.

The Utah Copper Co. has a force of about 600 men engaged in constructing the mill at Garfield. While the equipment of the first section is in progress, good headway is being made with the foundations of the second unit. The steel structural material for the latter has begun to arrive from the plant of the Minneapolis Steel & Machinery Co.——Ore shipments have been started from

the Cedar mine, in Beaver county, where some large bodies of lead-silver ore were recently developed.——The Western Pacific Railroad Co. has filed maps showing the right of way of this new line from Salt Lake City west to Nevada. The route chosen goes north of the Gold Hill mine of the Western Utah Copper Co. in the Clifton district, or Deep Creek, about 30 miles. It is the intention of the copper company to erect a large plant, which means the construction of a branch line early next year. The road can be easily built, as the country is level all the way to the foot of Gold Hill mountain. This Deep Creek country is looking up, and all indications point toward much activity there during the next year.

It is claimed that 12,000 tons of ore of the value of $50 per ton has been developed in the Jenny Mining Co.'s property at Cold Springs, Utah, of which Charles A. Short is manager. In a cross-cut from the 115-ft. level of the shaft a 12-ft. vein of ore was encountered, four feet of which is reported to assay close to $100 per ton in gold and silver. This company has arrangements completed for the erection of a mill.

The Cactus copper mine in Beaver county, operated by the Newhouse Mines & Smelters Corporations, has come into considerable prominence lately owing to the opening of a tremendously large body of ore to the south of the developed portions of the mine. On the fourth level, the vein shows a width of 175 ft.; on the fifth level it has been cross-cut for 225 ft. without exposing either wall, and on the sixth, or tunnel level, a cross-cut is being pushed through the ore and is now in about 75 ft.; on the same level a diamond-drill has been sunk 260 ft. in ore of the same character. While the body contains much ore of a shipping grade, the mill stuff is said by Samuel Newhouse, the president, to contain at least 100% better values than that found in other portions of the mine. The mill is being supplied with ore from the 'glory hole' where the ore is broken by steam-shovel and dropped to the tunnel level and conveyed through that avenue to the mill, which is handling 800 tons per day and making a saving of about 85% of the values. The new strike carries more precious metals than the older developed orebodies.

Butte, Montana.

Exploring Outlying Territory Northeast of the Town.— Also in the Eastern Ridges.— The Discovery in the Bullwhacker.— Diamond-Drilling at the Cable.— Vigorous Development of Coalition Mines.— Production From the Speculator.

The Butte & Bacorn Co., largely financed at Pittsburg, is getting the shafts on the Belinda and Calumet claims, near the point where cross-cutting will begin, and the results of the work it is doing will go far to test the theory that the Butte copper deposits reach far to the northeast of the Butte hill, where the richest Amalgamated and Clark properties are situated. The Butte & Bacorn claims lie still farther to the northeast than the North Butte claims, whose remarkable discoveries proved that the theoretical boundary of the copper-producing region was by far too narrow. This company has reached the 500-ft. level with the two shafts just mentioned, figuring from the collar of the Belinda shaft, which is 60 ft. higher than that of the Calumet, the company having adopted the Boston & Montana Co. method of having a single system of levels for their various claims in the same group. When the 600-ft. level is reached a cross-cut will be run to the vein and the country will be explored. If nothing is found at this depth, sinking will be continued, at least to the 1,000-ft. level.

One of the most important ventures in the way of exploration of the country about Butte, is the Greenleaf shaft now being sunk by the Boston & Montana Co. This shaft is on one of a group of claims lying near the base of the ridge east of the city. The shaft has already reached the 500-ft. level, where a station has been cut, and sinking has been resumed, the declared intention of the company being to sink to 1,000 ft. at least, and at any rate not to desist until thoroughly satisfied that there is no ore in the claims. These claims, like many others that lie along the base of the same ridge, and even well up on the slope, are crossed by strongly marked and wide veins. Several companies, including the Bullwhacker, Lewisohn Development Co., Butte & Summit Valley Co., Ida Montana Co., and others, are working in similar country along the base of the mountain, and a strike of rich ore in the Greenleaf group would mean much to the other companies.

Exaggerated reports have been circulated concerning a strike in the Bullwhacker claim. The truth of the matter appears to be that the cross-cut at 500 ft. was only started a month or so ago, and has not yet reached the main vein, the rich ore which was found being only a narrow streak detached from the main vein. There is no doubt, however, that the finding of this small body of ore is a good indication of mineralization at that depth, and the wide vein which lies beyond, and which is a part of the vein system that runs north and south along the base of the eastern ridge, may well contain orebodies of larger dimensions. Nothing of any commercial importance has been found, as yet.

The Cable Con. Mining Co., which has extensive placer holdings and quartz mines west of Anaconda, is continually milling the gold ore from its Cable mine, and is making ready to develop the copper lodes which were discovered by diamond-drilling in the bedrock below the gravel. The last holes put down with the drill show better in gold and silver than the others. —— The Never Sweat mine of the Anaconda has again been closed down for a couple of weeks to allow of setting the hoisting engine, whose bed is on shifting ground on the foot-wall of the vein. The mine was closed for a short time last spring for the same reason.

A. T. Carson, manager of the Butte Coalition properties, says that the present policy of rapid development, rather than extensive mining, will be continued. The Nipper properties, belonging to the Coalition Co., and containing the much litigated Blue, or Nipper vein, are now being worked through the Parrot shaft. Mr. Carson says that the ore from the Nipper will continue to be raised through this shaft, which is capable of hoisting more ore than is now being taken out from the Parrot and Nipper combined. About 100 tons are being hoisted daily from the Nipper workings. The mine is only being worked on the 1,000-ft. level. The ore which lies between this level and the 500, has been tested sufficiently to show that there is a large body of commercial copper ore, enough to make the Nipper one of the most important mines in the district.

The Speculator shaft of the North Butte Co. is hoisting about 1,100 tons daily, for the most part first-class ore. Skip-chutes are in service on the 1,000 and 1,200 levels, and the chute on the 1,600 level will soon be ready for use. The development of the mine is still the main object of the working, and the output will be gradually increased from the ore already blocked out on the Jessie and Edith May veins. Within the year the Berlin will probably be yielding ore, and there is every reason to believe that the company will have a continually increasing output for many years to come, merely from the work now under way.——An Allis-Chalmers engine and hoist, a duplicate of the one soon to be installed at the Pennsylvania mine, has been ordered for the new Tramway shaft, from which the ore of the Minnie Healey and neighboring Coalition mines will be hoisted as soon as the shaft is deep enough.

Mining Summary.

ARIZONA.

YAVAPAI COUNTY.

(Special Correspondence).—An important discovery was made recently in the Swiss Girl claim, one of the Baumann Copper Co.'s group, situated about midway between Prescott and Jerome. The body of ore was encountered about a week ago, when a cross-cut was started from the 960-ft. level of the deep shaft after the second round of machine-drill holes was blasted. The cross-cut has already been driven a distance of 20 ft. without encountering a wall through the solid body of sulphide ore, which has been found to carry enough gold, silver, and copper, to ship the whole mass to the plant of the Arizona Smelting Co., at Humboldt, for treatment. A body of ore almost similar in character to this was found in the 500-ft. level, but the values at this depth were found to be not nearly as large as that of the new find. Work will be continued in the lower cross-cut until the walls are struck, when the work of opening it by a series of drifts and cross-cuts will be at once commenced, while the work of continuing the shaft to greater depths will be continued and the orebody exposed on the deeper levels. Encouraged by the extent and importance of the new discovery, the company has now under consideration the construction of a narrow gauge railroad from the Swiss Girl shaft to the Humboldt smelter.

Phoenix, October 20.

CALIFORNIA.

CALAVERAS COUNTY.

The new mill at the Hamby mine is now completed, and the stamps will commence to drop as soon as the transformers are in place so that the power can be turned on. There is an abundance of good ore to keep the mill running steadily. —— The mining plant owned and operated by Albert Arents, of Alameda, situated about three miles from Copperopolis, has been completely destroyed by fire. The fire, of unknown origin, started about 8 o'clock, and laid in ruins the entire plant, consisting of a roaster, a five-stamp mill, and a cyanide plant, aggregating a loss of about $20,000.

ELDORADO COUNTY.

The machinery for the French Hill mine has been received and the mine is working again after a short suspension. A Keystone drill is prospecting on the Broder place in the interests of the Blue Ravine Mining Co. If prospects hold good another new plant will be erected.

SISKIYOU COUNTY.

A large vein of ore was struck at the Snoozer mine on Russian creek by the Zarina Mining Co. recently, while they had men doing assessment work on the property. The vein is said to be of good size, and of a high-grade milling ore.——While working in tunnel No. 4 on the Blue Ledge mine, a narrow vein of quartz was encountered, about 80 ft. from the mouth of the tunnel from which was taken a mass of gold that weighed over $7,000.——At the Seattle mine, there are about 80 miners at work at the mine and about 40 men employed surveying, grading, etc.——The hydraulic miners at Oro Fino, Quartz Valley, and other districts, are busily engaged in fixing up their apparatus and machinery, to be in readiness for operations as soon as the winter rains furnish a good supply of water.

TUOLUMNE COUNTY.

(Special Correspondence).—A contract has just been let for the driving of a cross-cut adit approximately 100 ft. at the Patterson mine. The adit will be 5 by 7 ft. Grading for a 20-stamp mill is in progress, and preparations are being made for installing a hoisting engine in the adit, 150 ft. from the mouth, where a winze will be sunk, and a raise is being put up.——The work of unwatering the Crystalline mine has been finished and a thorough inspection of the property for the Table Mountain Gold Mining Co. will shortly be made. It is expected that by Nov. 1 a large crew of men will be put to work. Driving south on the vein from the bottom of the shaft is contemplated and it is likely that the mine will be developed to a greater depth.——All hopes that the water supply would last until the rains set in, were shattered early last week when the announcement was made that it was nearly exhausted. The stoppage of power came as announced, and as a result active operations were suspended at a number of the mines of the county.—— Eighty men are employed at the Melones mine and the 100-stamp mill is kept in steady operation.

Tuolumne, October 22.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence).—Activity in mining increases each week in and around Georgetown. Surveys have just been completed for two new railroads; one will be a broad-gauge road from Denver to the Vidler tunnel, now being driven through the range under Argentine pass, and is called the Denver & Trans-Continental Railway Co. The other is the Santiago & Georgetown railroad, which will connect the Santiago mine with the aerial tram, now being built from the terminus of the C. & S. railroad at Silver Peak, and will enable the company to send down 50 tons or more of ore per day to its mill at Georgetown at a very low cost per ton. Passenger cars will be run in summer, affording sightseers over the loop and up the aerial tram to take in the rugged scenery of the range. At the Santiago mine, 25 tons per week of $90 ore is sent to the mill by wagon. —— The Denver & Trans-Continental Railway Co. was incorporated by Charles Baldwin, of Colorado Springs, and Rees C. Vidler, of Georgetown, with a capitalization of $20,000,000. The road will be one of the scenic roads of the world, coming up Clear Creek cañon from Denver to Georgetown, thence around the mountains through the Vidler tunnel into the Horseshoe district, and on to Salt Lake and the Pacific Coast. This will open up the Horseshoe district, including Montezuma, Rathbone, Keystone, and Argentine, giving an outlet for its low-grade ore, of which there is a superabundance, and a much cheaper rate on supplies going in.

The main adit of the Capital Mining Co. is now in 4,400 ft. For the last 200 ft. it has been passing through a lode, the south wall of which has not yet been encountered. A three-foot vein of lead and iron pyrite was cut this week which assays $30 per ton, alongside of this is 12 ft. of fine mineralized quartz. The adit will be pushed ahead till the other wall is reached.——B. J. Martelon & Co., of Idaho Springs, recently took hold of the old Pulochi mine on Leavenworth mountain, which was a large shipper years ago. They shipped a car of concentrating ore which gave most satisfactory results. The old workings will be opened and put in shape with all speed. The lessees on the Lebanon who have been shipping $40 ore made a strike of $200 ore last week.——Tom Cunningham, working the Queen of the West has encountered good ore but is still driving the adit ahead to come under the old ore-shoot from which ore milling many hundreds of ounces in silver per ton were taken. ——The Krupp Mining Co., operating on Beaver gulch cleaned out an old adit on the property and at 250 ft. in opened up four feet of ore assaying 100 oz. silver per ton.

The Two American Sisters Mining & Power Co. has encountered a large orebody in the lowest workings, which assays high in silver. This company's power-plant below Georgetown is rapidly nearing completion. It has also purchased a concentrating mill at Empire which is now being torn down and transferred to the mine at Silver Creek.—— A cave in the roof of the adit on the Maude Carrie disclosed five inches of ore which assayed 53 oz. silver and $7 in gold per ton.

Georgetown, October 22.

Another good strike has been made in the Wilcox tunnel of the Waldorf Co.'s property, the ore being found in a vein that was cut in the tunnel at a distance of about 1,900 ft. from the portal. Driving was recently commenced on this vein and this has resulted in opening a fine body of ore carrying gray copper, silver glance, and peacock copper, and having a value of several hundred dollars per ton. As this vein has been cut at a depth of 360 ft. from surface it gives a large block of stoping ground. In addition to about 15 in. of this high-grade smelting ore there is about two feet of concentrating material in the lode.

LA PLATA COUNTY.

(Special Correspondence).—This district has shown increased activity during the past few months and the prospects for a good winter are encouraging. The May Day, which is owned by A. E. Reynolds and associates, of Denver, is one of the bonanza mines of the State. They are shipping about two cars of ore per day from this property. —The Bonnie Girl Co. has closed down the mill on account of repairs. The foundations for the stamp-batteries were made of concrete, but, on account of the lateness of the season in which the work was done, they did not prove satisfactory. The concrete is to be replaced by timber foundations. —— At the Durango Girl a rich shoot of ore is being opened up. This mine is to be equipped with power-drills. —— The Tomahawk Mines Co., of which E. H. Lunken is president, and Geo. W. Gilmore, treasurer, is doing development and prospecting work. The adit, which is now some 350 ft. long, is being driven as fast as possible by Temple-Ingersoll drills. About the 500-ft. mark they expect to cut the Tomahawk and Clyde veins, which were located in the early eighties. The ore from the workings at the surface assays from $10 to $200 per ton. The adit will cut these veins at a depth of 600 ft., and by driving a distance of 1,000 ft. can be gained.

La Plata, Oct. 20.

SAN JUAN COUNTY.

At Gladstone the Gold King mill, under the management of W. Z. Kinney, has been overhauled and Card tables put in place of vanners and slime-tables. The extraction made by this plant is considered most satisfactory.——F. W. Bosco has charge of the big Mogul mill, which he hopes to have running at full capacity within a few weeks. The mill consists of 40 stamps, of which 15 are in operation at present. One car of concentrate is being made daily. The concentrating part of the mill is composed of Card and Wilfley tables and Blake magnetic separators. The product is lead, zinc, and iron.

The Big Colorado on the south fork of Cement creek, about one mile from Gladstone, is being developed under the management of C. W. Bloodgood. The Adams electric drills are being used in the tunnel work. Across the gulch, the Natalie Co. is re-constructing its power building which was injured by snowslides last winter.——A short distance below the Gold King and Mogul mills, the Henrietta Co. is doing considerable work and making shipments.——Farther down the gulch on Cement creek, A. A. Lamont is developing his property and preparing to ship a car of ore.——Near the mouth of the canyon and on the line of the branch railroad from Silverton, the smelter is being operated by the Ross Mining & Smelting Co. on ore from its own mines as well as custom ore.

T. R. Henahen is still doing development work on the North Star and hopes in the next few months to be in a position to start the mill.——Thomas Kane, manager of the Hercules Mining Co., is overhauling his mill, and has suspended development work in the mine until the mill is ready to run.——Cunningham gulch is the scene of much activity. The Highland Mary, near the head of the gulch, is operating at present. The mill belonging to this company is idle. The new mill of the Green Mountain Co. is in charge of C. J. Garvin, formerly superintendent of the Portland mine at Cripple Creek. Several changes are being made in the mill, which is credited with a capacity of 120 tons per day. About 100 tons are being treated at present. It is Mr. Garvin's intention to install electric power shortly because it is quite expensive to operate with steam, although coal can be delivered at the mill by rail. The power will be secured from one of the big power companies. The mill is connected by aerial tramway with the mine.

SUMMIT COUNTY.

Several tests are being made at Denver by various magnetic separating machines on the zinc-iron concentrate of the old Union mill. When it has been decided which is the best machine for this work, two or more of them will be shipped to Breckenridge. J. B. Sherwood, of Ripon, Wis., who is the treasurer of the company, has been at the mine, accompanied by Dr. A. H. Abbott, of Oshkosh, another director. The Blue Flag on Bald mountain is now running and good returns are expected from the first clean-up.——J. Parke Channing, of New York City, has been at Breckenridge for some days investigating the results of the drilling tests on The North American placers along the Swan river. This is being done with a view to a purchase of the property by New York and London capitalists, clients of Ben Stanley Revett, the noted hydraulic engineer.——The Oro Grande placer, at Dillon, ten miles west of Breckenridge, is now under option to the Summit Banner Placer Co.——W. W. Wonser, secretary of the Square Deal Co., has been making an official visit to the property in order to report on the latest developments.——The Four Most mine on Chief mountain, at Frisco, is likely to change hands shortly. A syndicate of Denver men is now considering the purchase of this property, which has been a good producer in the past.——Francis L. Judd and associates, of Topeka, Kansas, have purchased some valuable property adjoining the Square Deal mine. The claims show good outcrops of copper ore.——A deal on the Masontown mine and mill is now in hand.

TELLER COUNTY.

The Aileen mine is now shipping at the rate of from ten cars per week to two cars per day. Nine machines are engaged in breaking ore in the 600-ft. level, the product being shipped without sorting and averaging $30 per ton.

IDAHO.

SHOSHONE COUNTY.

The new 200-ton concentrator at the Success mine will start work in the middle of next week. This mine contains two great bodies of ore which are known respectively as the foot and hanging-wall ore-shoots. One has been proved to be over 200 ft. long on the No. 3 tunnel level, where it has an average width of fully 12 ft. It has also been opened up for the same length in three intermediate levels, 100 ft. apart, between the No. 3 tunnel and the old workings, 460 ft. above. In the first of these levels the ore-body is over 50 ft. wide at one point and for the greater part of its length it averages over 25 ft. in width.——The winze being sunk on the Charles Dickens, on Moon gulch, near Wardner, is exposing some fine galena ore. There is a double-compartment shaft sunk on this property to a depth of 152 ft. From this level, A. D. Birtman, who holds an option on a majority of the stock, is sinking a winze on the vein. He is down 70 ft., where he has just completed a cross-cut of 12 ft. on the vein and but one wall in sight. In this 12-ft. cross-cut there is at least 20 in. of solid galena ore, while the balance of the vein is good concentrating ore. Assays made on samples from this cross-cut run 65 to 78% lead, giving a half ounce of silver to one per cent of lead. The 50-ton concentrator ordered by Mr. Birtman some time ago was shipped the first of the week.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The electrical machinery for the plant which is to furnish light for the entire camp, as well as Searchlight, is all installed with the exception of the dynamos which are being hauled by team from Manvel and within the next week the plant will be in full operation. The railroad camps are plainly visible from Searchlight, and the grading and track laying is rapidly being pushed toward completion. The Eldorado Canyon district and the new Thurman camp at Newberry mountain both tributary to Searchlight show increasing activity. The hospital for the accomodation of the sick and disabled miners of the district is being much improved under the direction and supervision of the Mine Operators Association.——The Gold Dyke Mining Co. is making contracts for the erection of a hoist and the sinking of the shaft to deeper levels. Assays run as high as $60 per ton. The property adjoins the Pompeii and the Blossom, $317,000 having been taken out of the latter mine within 50 ft. of the surface. From all appearances the Gold Dyke will make one of the large producers of the district.——On the Colorado M. & M. Co.'s shaft they have struck some water at 215 ft. but not enough to necessitate a pump, however. H. Adsit, the manager, has contracted for pumping machinery in case the occasion demands it. The shaft is double compartment;

the showing so far is excellent.——Contract has been let for a 100-ft. shaft on the Golconda, which is located near the Yellow Rose and Gold Dyke; the work is already under way.——The Cyrus Noble Extension shaft at a depth of 180 ft. finds the orebody steadily increasing in size and quality. ——The Duplex, the first mine located in the camp, is working day and night with a force of 72 men. They are cyaniding the tailing, which runs between $5 and $6 per ton. The cost of $1.12 leaves a net profit of between $4 and $4.50 per ton.——The Nevada Consolidated in the McGhan camp has one hoist in operation. The shaft at 260 ft. has encountered another new orebody with a width of four feet, assaying as high as $60.——A new map of the Searchlight mining district has just been issued by Stone & Brown, Inc., mining engineers and U. S. Deputy Mineral Surveyors, and as it is made up directly from survey notes, its accuracy is a noteworthy feature. The new map shows over 500 claims in a territory slightly more than five miles in length and somewhat less than five miles in width, taking in the larger part of T. 28 S., R. 63 E., Mt. Diablo B. & M. in the northern portion of T. 29. It is drawn on the scale of 800 ft. to the inch.

Searchlight, Oct. 22.

(Special Correspondence).—Representatives of the Occidental & Oriental Wireless Co. of the Pacific Coast have been in Searchlight for the past few days making arrangements preparatory to installing a wireless telegraphy station.——Last week there were many sensational discoveries of orebodies in the outside districts, thereby enlarging the generally recognized mineral belt. Reports from Newberry mountain are very encouraging, and the first shipment of ore from Camp Thurman has been made to the Salt Lake smelters. In Eldorado Canyon ore was struck on the Eagle group, owned by W. J. Kennedy, adjoining the Capitol mine, assaying 3,000 oz. silver per ton. On the 'Flat' west of Searchlight, strikes were made on the Wyoming-Searchlight in the shaft at a depth of 209 ft., on the Sunny Jim in an open-cut, and on the Searchlight-Vanina in a drift from the working shaft. At the bottom of the shaft in the Annette, in the foot-wall, at a depth of 150 ft., specimen ore was struck. This snug little acreage adjoining the Southern-Nevada has ore that has assayed as high as $200 per ton.

Two miles northwest of Searchlight, in the immediate vicinity of the estate of the Searchlight Mining & Milling Co., lies the Sunny Jim group, owned by the Sunny Jim Mining Co. This group consists of the Sunny Jim, Sunny Jim, Jr., Talco, Big Horn, and Old Charter claims. At the bottom of a 30-ft. shaft on the Sunny Jim, a large body of ore has been opened up that gives an average assay of $8 in gold. The values on this property are very uniform, and have been found in every cut opened on the four parallel veins. There are three distinct veins traversing the Sunny Jim claim ; the surface assays run as high as $56.——Fredericks & Co. have taken a contract to sink a shaft 5 by 7 in the clear, thoroughly timbered to water-level.——Development is proceeding very rapidly on the Duplex Extension, adjoining the John Brockman mine. Superintendent Essenhardt is sinking the shaft on the Euchre claim and has almost reached the 100-ft. level. The vein is widening and the values increasing as depth is being attained. At present the shaft is down 96 ft., and the vein is five feet wide, dipping at an angle of 45%. The vein is oxidized and heavily mineralized with iron, with a talc seam next to the hanging wall carrying gold values. Everything in the shaft gives hornings. A gasoline hoist will be installed at once, as depth has almost outweighed the carrying capacity of the windlass. Bunches of ore have been encountered in the shafts on the Regal and East Side claims, carrying values in gold and galena. Systematic development is being prosecuted and the management will have three shifts at work after the hoist is installed.

The Little Eldorado Mining Co. has resumed development work on the property of the company in the cañon this week. John Howe has taken a contract to sink a shaft to water-level, also to do an additional 500 ft. of underground work. The company owns the Little Eldorado, Thelma K., Keystone, Western, Red Butte, and Soldier Boy claims, and 120 acres of placer ground, together with a mill site. Assays have been received as high as $225 in gold from the shaft on the Soldier Boy claim. A townsite has been laid out, platted, surveyed, and patents applied for. The new town is known as Nelson and already has a post-office and telephone station. The latter has wires to the Venus, Black Hawk, Eldorado-Nevada, Combination, Silver Sphinx, and the Kennedy camp, besides a long-distance line to Searchlight, Nippon, and Barnwell.

Searchlight, Oct. 24.

SOUTH DAKOTA.

CUSTER COUNTY.

Custer seems to be the centre for the black sand interest which is still kept up, and many locations have recently been made covering the old and worked-out placer claims in the district. Quite a number of small sales have taken place, the most notable of which has occurred in Tenderfoot gulch, about six miles north of Custer, where one-third of a claim was sold for $1,500. The values vary, but it has been ascertained that all the black sand in this district will yield a profit when properly treated. The method employed is concentration and cyaniding the concentrate.

The Ivanhoe, eight miles northeast from Custer, is the only mill running in the county at the present time, yet there is more energy displayed in the line of development than has been observed for several years. There has been no less than five different groups of quartz mines in this district sold (under bond) during the past month. —— The Saginaw Co. is still driving on the 400-ft. level and has lately passed through two veins of ore, the one 14 ft. and the other 8 ft. in width, the larger vein being of a good grade, and the lesser one said to be very rich in gold, much of which is free, and the remainder in the form of sylvanite and bismuth telluride. In the new mill soon to be erected L. P. Woodberg has concluded to adopt the 'National ore pulverizer' instead of stamps. —— Supt. Millham has put a crew of miners at work on the Interstate group of mines, seven miles northwest from Custer. They are sinking on the main shaft, which carries a vertical vein of quartz of good grade 8 ft. in width. —— Supt. Moyer of the Girtie mine, near Hill City, is improving the method of concentrating the cassiterite taken from the mine.

The Clara Belle mine is still mining and milling ore from the old shaft at a good profit while it is sinking a new working shaft, which is now down a little over 100 ft. They expect to strike the large orebody (which is of high grade) in a few days.—— J. Guertin, connected with the Westinghouse Electric Manufacturing Co., returned from the East a few days ago with five families of children of suitable age to work in the mica factory, to help in the mine, and in the mica splitting and trimming department. They require 100 at present and expect to employ 200 as soon as they get their new factory built, which will be some time next spring. F. N. Myers is superintendent at this place.

The Ochre mill, which has not been running since the death of the owner, Henry Robbinson, is now ready to resume operations with full capacity.

It is reported that the Extreme Mining Co. will resume development on its property in a short time. They have a ten-stamp mill on the ground which ran for a while, but closed down on account of the refractory character of the ore.

UTAH.

SALT LAKE COUNTY.

I. T. Long & Co., owners of the Basin mill, has leased the Tornado mine, or that part of it known as the Indiana vein, which crosses the main Tornado tunnel at a depth of 150 ft. In addition to the work of the lease on the cross-vein, the company will continue the main tunnel to cut the Tornado vein, which parallels the Indiana about 400 ft. to the south.

WASHINGTON.

FERRY COUNTY.

A recent strike in the Gwinn mine, east of the Sherman range, on the Columbia river, shows ore 14 ft. wide that assays $6.19 gold, 23 oz. silver, and 9% lead. On the north and south extension of the Gwinn, two groups of claims

have been sold to a Tacoma syndicate for $20,000 and $15,000 respectively. A strike of ore three feet wide has been encountered on one of them and appears rich. —— The Silver Creek Mining Co., five miles east of Keller, on the Gold Cord mines, is driving an adit, on two shifts, to strike the vein 304 ft. deep and connect with a winze, at the bottom of which the vein is seven feet wide, with two and one-half feet of shipping ore. This company is a twin corporation of the Keller & Indiana Con. Smelting Co., and has contracted to send all of its ore to that company's smelter. —— The Lorraine Copper Co. has contracted for delivery of 1,000 tons of ore from the Malachite claim to the same smelter, and will resume work on it immediately for that purpose.——At the Iconoclast mine an adit has been driven 175 ft. on the vein, which carries an average of three feet of ore for that distance, and spots of native copper have been observed all through it. —— A cross-cut from the bottom of the shaft on the Umatilla group has intersected 14 ft. of shipping ore. A tunnel has been already driven 120 feet.

On Dick creek, west of the Sans Rail river, an important lode has been discovered by Charles Fogarty, an old Comstock miner, cropping 180 ft. in length and 24 ft. in width. The ore is said to be principally iron oxide in a purple quartz gangue, and assays in gold, silver, and copper.

The Orient mine has been closed down because of disagreement among the directors of the company.——The Gwinn mine has been bonded for $10,000 and two payments made. In a shaft 150 ft. deep the vein was found to be faulted on the 100-ft. level. From the bottom of the shaft a cross-cut was driven eastward 67 ft. and the vein found. In a drift 70 ft. south from the intersection some good gold-silver ore was found. A winze was started on it, but was abandoned on account of impure air. An adit is to be driven to tap the vein about 550 ft. below its apex and 140 ft. below the bottom of the shaft.——The Anonymous shaft was sunk 30 ft. on quartz of low value and then abandoned. Work has since been resumed on the lower adit.

The Oversight Mining & Milling Co. is advertising for teams to haul ore to the Belcher Mountain railway.——A shaft has been sunk 70 ft. on the foot-wall of a 12-ft. vein on the North Star mine. The ore assays from $20 to $36 per ton. An adit has been started to tap the vein 130 ft. deep. ——The Humboldt Mining Co. has let a contract for driving the adit another 80 ft. It is expected the vein will be encountered at that distance about 450 ft. deep. A shaft was sunk 25 ft. on the vein and ore uncovered which assayed from $63 to $80 per ton in silver and lead.——At the Umatilla mine a shaft was sunk on ore which averaged $45 per ton in gold and copper. Assays run as high as $80 per ton. The adit under way is expected to strike the vein 180 ft. from the portal and 150 ft. deep.——An adit has been driven 20 ft. on a body of ore in the Copper King mine, but did not pass through it. Another adit has been started to tap it at a depth of 70 ft. The ore is rich in silver and copper.—— Ore, supposed to be wolframite, has been found near Keller, at the head of Copper creek. An adit has been driven across it 20 feet.

The Belcher Mountain railway, nine miles long, running from Belcher spur on the Great Northern Kettle river branch, near Curlew, is completed. A surface tramway, with a capacity of 600 tons of ore per day, is being constructed to carry the ore from the mine to the railway.

OKANOGAN COUNTY.

The Copper World shaft has been sunk 135 ft. on the vein. The manager reports a continuous body of ore.——The Q. S. Mining & Smelting Co. has elected as trustees for the ensuing year. A. M. Dewey, president; M. L. Bevis, vice-president; C. L. Shuff, secretary; E. J. Hyde, treasurer; L. K. Armstrong, consulting engineer. There were 1,900,000 out of 2,000,000 shares represented. The company has 567 shareholders of record. The president reported the payment of debts amounting to $6,000, and an expenditure of $16,000 on the mine during the past year. An electric power plant is being installed. Hand-drilling has been discontinued, as the compressor plant is nearly ready for machine-drilling. During the coming year the company will drive a new adit to give 1,500 ft. of depth below the present lowest workings

STEVENS COUNTY.

The Panhandle Mining Co., of Idaho, has purchased the ore-dumps of the Queen, Providence, Deertrail, and Silver Seal mines, containing tungsten. The mines are situated in the Cedar Cañon district, in Stevens county. It is reported that the Krupp Government Gun Manufacturing Co., of Germany, has purchased five tungsten claims in this district. —— The First Thought Gold Mines Co., Ltd., has contracted to deliver 1,500 tons of ore per month to the Northport smelter as soon as the latter starts up. —— The Mammoth Silver-Lead Co. has driven an adit from the Pen d'Orielle river bank into a body of ore, mostly galena, tapping it 90 ft. deep. —— The United Copper Mining Co., of Chewelah, is driving an adit 600 ft. in length to connect with a shaft at a depth of 120 ft. The shaft, a single compartment, is being enlarged to a two-compartment. A cross-cut on the 100-ft. level shows the vein about 25 ft. wide, with ore assaying 12% copper. A steam-hoist and plant for steam-drills are being installed, and two shifts will work all winter. New office, bunk and boarding houses are being erected.

MEXICO.

The American Smelting & Refining Co. has blown in the first two furnaces of its copper smelting plant at Valardeña, Durango. Others will be blown in from time to time. The capacity of these two will be from 350 to 400 tons per day. This smelter is planned to be as large as any in Mexico. ——The Pinguico mine, in the Guanajuato district, is now producing from $15,000 to $20,000 per week. The bulk of the ore is being shipped to the smelters, and the remainder is being treated at the Central plant. An adit is being driven through the adjoining Carmen property of the Guanajuato, Con. Mining & Milling Co., and this will give an additional depth of 200 m. in the Pinguico. The adit is being driven for the joint account of the Guanajuato Development Co. and the Guanajuato Consolidated.

PARRAL.

It is stated that a 100-ton reduction plant will be constructed at Parral for the treatment of custom ore. The syndicate proposes to make a flat rate of $5 per ton, which will render available a large tonnage of ore on the dumps. By the beginning of next year the 250-ton cyanide plant of the Veta Colorado Mining Co. should be completed. This will be the first cyanide plant in the Parral district, and if it proves a success, another 1,000-ton custom plant will be immediately erected.

BRITISH COLUMBIA.

OUTPUT OF MINES IN THE BOUNDARY DISTRICT, B. C., FOR WEEK ENDING OCT. 13.

Mines.	Tons.	Mines.	Tons.
Brooklyn	2,706	Rawhide	792
Centre Star	225	St. Eugene	750
Emma	254	Snowshoe	745
Granby	13,669	Strathmore	53
Idaho	330	Sunset	757
Iron Mask	150	Ymir	22
Le Roi	2,940	Smelters.	
Le Roi No. 2	90	Granby	9,743
Mother Lode	1,800	B. C. Copper Co.	2,676
Mt. Rose	100	Dominion Copper Co.	4,687
Providence	121		

The work of developing the mine and of installing the new machinery at the Centre Star continues. The recent shipments from the mine were of ore extracted in development. The sinking of the shaft between the twelfth and thirteenth levels continues and good progress is being made. The construction of the head-frame for the new hoist is progressing. The old War Eagle compressor-plant will soon be in position, as the foundation is ready for it. There is considerable advance work to be done in the mine, and the company will endeavor to keep the larger portion of its employees busy during the time the Trail smelter is shut down.

At Le Roi No. 2 the re-timbering and repairs to the shaft continue, and this task will occupy about three weeks. The machines are kept at work breaking ore. No development work is in progress, for the reason that waste cannot be hoisted while the shaft is under repair. Shipments from Le Roi are up to the average. No more ore will be sent to Trail until a supply of coke has been received, but shipments will be made to the Northport plant, where the ore will be accumulated for the present.

Personal.

HORACE G. NICHOLS is at London.

ERNEST A. WILTSEE is at Mexico City.

S. HERBERT WILLIAMS is at Ely, Nevada.

EDGAR RICKARD was married on October 24.

THEODORE F. VAN WAGENEN is now at Phœnix, Arizona.

E. MAY of Lead, S. D., has returned there from Nevada.

J. M. ILES is on his way from London to Coquimbo, Chili.

W. E. CONDON is engaged in railroad surveying near Ely, Nevada.

H. L. SWAN is visiting the Paymaster mines near Tucson, Arizona.

LEO VON ROSENBERG has returned to New York from Georgia.

PHILIP L. FOSTER has opened an office at 111 Broadway, New York.

DUNCAN CHISHOLM has returned to Colorado Springs from Nevada.

JOHN S. MACARTHUR is examining the Fresno copper mine, in California.

C. S. RICHARDS, of the Nundydroog mine, is at London, on a visit from India.

C. L. BLACKMAN, of Denver, is at Silver City, New Mexico, on mining business.

MERRILL A. MARTIN, of the San Francisco Mint, has returned from Colorado.

CLAUD HAFER is superintendent of the Gatewood Mining Co., at Howard, Oregon.

GOMER THOMAS, State Mine Inspector for Utah, has returned to Salt Lake from Denver.

GEORGE L. EDDY has accepted a position at the Densmore mine, Columbia, California.

T. JOHNS RIGBY is at Chicago and expects to be at Mayer, Arizona, within the next ten days.

F. B. REECE has gone to Mexico as assistant to H. H. WEBB in the examination of mines.

FRANK PROBERT, of Los Angeles, has been examining mines in Amador county, California.

GEORGE H. EVANS has returned from examining mines in the States of Puebla and Oaxaca, Mexico.

HENRY BRÉLICH, general manager of the Anglo-French quicksilver concession in China, is visiting London.

F. F. SHARPLESS passed through El Paso on his return from the Sahuayacan district of Chihuahua, Mexico.

THE Geological Survey was represented at the Mining Congress by WALDEMAR LINDGREN, J. A. HOLMES, and E. W. PARKER.

H. S. CLARK, western manager for the Lanyon Zinc Co., and WILLIAM ROGERS, managing director, were at Breckenridge, Colo., recently.

ROBERT H. RICHARDS has returned to Boston from New York, where he was in consultation in regard to a concentrating proposition on the Pacific Coast.

STANLY EASTON, manager of the Bunker Hill & Sullivan mine, at Wardner, Idaho, has been on a visit to San Francisco, to attend EDGAR RICKARD'S wedding.

A. B. W. HODGES, for three years superintendent of the mines and smelter at Granby, has been appointed local manager for the company, with headquarters at Phœnix.

THE Exploration Co., Ltd., has opened an office in the Trinity Bdg., New York. P. L. FOSTER, the mining adviser of the company, will be resident manager of this office.

AMONG those who attended the Mining Congress at Denver were W. R. INGALLS of *The Engineering & Mining Journal*, R. L. HERRICK of *Mines & Minerals*, and KIRBY THOMAS of the *Mining World*.

A. N. SPENCER, technical engineer of the Harbison-Walker Refractories Co., Pittsburg, Pa., has just returned from a six months' trip among the smelters in Mexico, the Southwest, West, and British Columbia.

JOHN B. FARISH and GEORGE J. MCCARTY have resigned as consulting engineers to the Dolores Mines Co. and the Mines Co. of America to devote the whole of their time to the Mines Finance Company, of New York.

PHILIP ARGALL, D. W. BRUNTON, GEORGE E. COLLINS, J. W. EDWARDS, G. C. HEWETT, ARTHUR LAKES, MARK R. LAMB, H. R. PLATE, GEORGE J. BANCROFT, and H. A. SHIPMAN were among those who attended the recent session of the Mining Congress at Denver.

J. M. BOUTWELL, geologist, United States Geological Survey, who has recently been placed in charge of statistics on the production of zinc, lead, and quicksilver in the United States for that bureau, was confined during the summer to St. Luke's hospital at Denver by typhoid fever. He is now visiting various points in the West in connection with this work, but owing to loss of time by his sickness will be obliged to postpone some of his itinerary for the field investigation of the resources of these minerals until the next field season.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, October 24.

Con. Virginia	$0.78	Manhattan Con	$0.75
Ophir	2.85	Jumping Jack	0.54
Savage	0.95	Midway	2.20
Tonopah Ex	5.25	Montana	3.65
Belmont	6.37	Mohawk	6.50
Jim Butler	1.41	Silver Pick	0.91
Jumbo	1.95	Sandstorm	0.70

METAL PRICES.
By wire from New York.

	Closing Prices October 18.	October 25.
Copper—Lake (cents per lb)	21.70 @22½	22 @22½
" Electrolytic "	20 @20.90	21½ @22
" Casting "	20¾ @21¾	21 @21¼
Lead "	5.75	5.75
Spelter "	6.03@6.06	6.10@6.15
Silver (cents per oz.)	69⅞	70⅛

ANGLO-AMERICAN SHARES.
Cabled from London.

	October 18. £ s. d.	October 25. £ s. d.
Camp Bird	1 8 3	1 7 9
El Oro	1 8 3	1 7 3
Esperanza	3 3 9	3 4 6
Dolores	1 13 9	1 15 0
Oroville Dredging	1 1 0	1 1 3
Stratton's Independence	0 3 9	0 3 9
Tomboy	1 9 3	1 9 3

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Oct. 18.	Oct. 25.
Bingham Central	2⅜	2¼
Boston Copper	33⅛	32¼
Calumet & Arizona	140	139
Cumberland Ely	13¾	12½
Dolores	8⅜	8⅜
El Rayo	6¼	6⅜
Guanajuato Con	5⅛	5
Giroux Con	12⅛	11
Greene Con	25¾	25⅛
Nevada Con	22	20¼
Nipissing	25¼	27⅛
Tennessee Copper	48¾	46⅞
Tonopah Ex	6	5¼
Tonopah-Belmont	6	6⅜
Tonopah	21	21¼
United Copper	67¼	63⅛
Utah Copper	36½	36

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Ah Woe Co., in Rocky Point Placer Mine, near Gold Run, Placer County, California, draining into Canon Creek; and from J. L. Zuver, Sr., in Wallace Canyon Consolidated Mine, near Long Canyon, Placer County, California, draining into Wallace & Long Canyon, gives notice that a meeting to receive any protests will be held at No. 1733 Pine Street, San Francisco, Cal., November 12, 1906, at 1:30 P. M.

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

PLATINUM is confined to basic rocks; in Russia and in British Columbia it has been found in peridotite. Formerly it was supposed to occur only in placers.

BARYTES is used as an adulterant for white lead and is added to paper to give it weight. It is often bleached by being boiled in acid to remove the iron stains.

THE average weight of a good four-ply rubber belt, 7 in. wide, is 16 oz. per linear foot. The best rubber belting is made with 32-oz. duck, and then weighs 20 oz. per linear foot.

VENTILATION PIPES of oval section are often more convenient than round ones having the same capacity. These pipes occupy less space in the drift or shaft and the extra friction is of no account.

GUNPOWDER is used in quarrying slate, as it is necessary to have a rending and not a shattering effect. When high explosives are used, it spoils the slate for many feet, though it may have little or no visible effect.

THE greatest item of repairs in connection with a belt-conveyor is the replacement of the belt, which is the most costly single piece of the apparatus. If the belt lasts five years, the cost of repairs will come to about 12.5% per annum.

IN a concentrating mill, the ore from different parts of the mine should be mixed to ensure a uniform standard. This is important, not only because it insures even working of the machinery, but because one can judge better of the performance of the mill.

ADEQUATE VENTILATION is one of the best preservatives for timber. A steamy atmosphere may rot 12 in. Oregon pine in six or eight weeks. Timber with cold water dripping on it will last longer than that in a dry drift, as the spores of dry rot are washed off the wet sets.

THE amount of power needed to run a concentrating mill will vary according to the size of the mill, as follows:

15 to 30	tons	capacity	daily,	1.50	h.p.	per	ton	of	ore	treated.
50 to 75	"	"	"	1.25	"	"	"	"	"	"
100 to 120	"	"	"	1.00	"	"	"	"	"	"
200	"	"	"	0.75	"	"	"	"	"	"

A SPEED of about 300 ft. per min. is commonly given to belt-conveyors, but 450 is not excessive. Belts have been known to run smoothly at a speed as high as 900 ft. per min., but the wear on both the belt and the idlers then was excessive and so high a speed is not recommended.

THE surveying of claims for patent from the United States Government can only be obtained by those who have received appointment of United States Deputy Mineral Surveyor, and they must have an order from the Surveyor-General of the State or Territory in which the claims are located before making any such survey.

MOISTURE in air-compressors is often the cause of a good deal of trouble. In the case of a compound compressor, this may be caused by suction through the drain-pipe of the cooling chamber between the cylinders, if it dips below the surface of the conduit into which it drains. If the compressor is provided with a governor on the air-intake pipe, it will take air until the required pressure is obtained, after which the intake valve closes and the compressor runs under high vacuum so that suction takes place. If this is the case it can easily be detected by the fact that the low-pressure cylinder will be dry, while water will be found within the high-pressure cylinder and the receiver.

A NEW application of wolfram is reported from Germany. The Osram electric lamp, in which the carbon filament of the ordinary glow lamp is replaced by fine wires of wolfram, is said to use only one-third of the energy required with glow lamps. A test of 1,000 hours gives a loss of brilliancy of only 3.6% in a 32 c. p. lamp.

AN experimental gas turbine has recently been constructed in France, which under test showed an efficiency of 18%. The turbine is of the impulse type, the casing being lined with refractory material. Gasoline is used as fuel, and is fed under pressure through an expanding nozzle, being ignited electrically and generating a temperature of combustion of over 3,000° F. The blades were cooled to a certain extent, while rotating by low-pressure steam admitted into the casing.

THE refinery at Argo, which was burnt on September 15, is not to be rebuilt. The Boston & Colorado Smelting Co., which owns this smelter, close to Denver, will send the gold bullion to the Denver Mint and the silver to Omaha. The refining process used at this pioneer establishment has proved expensive, owing to the special skill required. The method has been kept secret for thirty years. Smelting of copper ores will continue as heretofore. Harold V. Pearce is manager, having succeeded his father, Richard Pearce, several years ago.

REFRACTORY MATERIALS should be tested for infusibility and insolubility in the presence of molten material to which they may be exposed. The former test is made by heating strongly small sharp-edged objects fashioned from the clay. To test this power of resistance to corrosion, the clay should be dried and one-third baked and ground to a coarse powder. This is mixed with the raw clay and made up into crucibles and burnt. One of the following charges may then be fused in the crucibles on a firetile in a hot muffle and the corrosive action determined: Granulated copper 30, borax 1; litharge 40; silica 12, sodium carbonate 2, hematite 5 grams.

SHAFT-SINKING.—The cost of sinking the shaft of the Victoria Quartz mine, at Bendigo, the deepest gold mine in the world, will interest our readers. The shaft is down 4,300 ft., the sump being 46 ft. below the bottom plat at 4,254 ft. A cross-cut is now being driven east at 4,125 ft. to pick up the reef which was discovered in the centre-country winze below 3,824 ft. Subsequently, the cross-cut at 4,254 ft. will be driven. The manager states that owing to the system of ventilation the air at the 4,024-ft. plat and between 4,154 and 4,254 ft., is good, and consequently some records have been made in the matter of sinking. The wages account for the period while sinking has been in progress amounted to £874, while material cost £749, making a total of £1,624. The cost per foot of sinking, therefore, averaged £5 16s., while the two plats involved an expenditure of £162. The principal items of expenditure were wages and firewood. The amount disbursed in wages was £787, or £3 1s. 8d. per ft., and £87 for the men engaged in cutting the plats. The firewood consumed in connection with the shaft-sinking was calculated at £315, or £1 5s. per ft., and for the plats £35. The timber for the shaft cost 13s. 3d. per ft. The cost of the explosive used was 7s. 3d. per ft. in sinking, and £10 in the two plats.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanidation vs. Chlorination.

The Editor:

Sir—In your issue of September 8, after giving the output of the ore treated by the Cripple Creek mills, the remark is made that "it being evident that cyanidation is gaining as against chlorination in the treatment of low-grade ores."

Two years ago (in *The Engineering and Mining Journal*) I ventured to predict that chlorination would prevail, in the treatment of Cripple Creek ores, as against cyanidation. Comparing my figures given at that time with those in your issue of September 8, it would appear that the advantage is entirely with the chlorination process.

TREATMENT OF CRIPPLE CREEK ORES, MONTHLY.

	Smelting		Chlorination		Cyanidation	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1904	11,000	$660,000	40,000	$1,019,000	9,000	$192,000
1906	7,500	600,000	35,000	966,400	4,700	21,000

This comparison speaks for itself. While the chlorination mills have practically held to their own record, they have gained relatively, both over the cyanide mills and smelters. Since two years ago, the tonnage treated by the cyanide mills has fallen 50% and the value of the ore treated now is only 10% of what it was then. It is true that several other cyanide mills will soon go into commission, which will augment the amount and value of the ore treated by cyanide, but it is equally true that two years ago a greater number, and larger, cyanide mills were going into commission than there are now.

There are at present, in the Cripple Creek district, ten cyanide plants having a total aggregate capacity of 1,600 tons per day. Only three of these mills are now operating, with a daily aggregate of 160 tons. Most of these mills were built, or at least first started operation, less than two years ago. None of the cyanide mills are now operating on a custom (that is, a competitive) basis.

There is no essential information, in cyanidation, available today which was not known two years ago. Almost every variation of the process has been tried at Cripple Creek, so that there is no particular reason for believing that the cyanide mills will meet with any better success in the future than they have in the past.

It is generally conceded that in the treatment of telluride ore by cyanidation, roasting, while not essential, is nevertheless desirable. The only plants at Cripple Creek which have met with success are those in which roasting formed an integral part of the process. Since roasting and percolation, in cyanidation, has not been able to compete with chlorination, it remains to be seen whether roasting, sliming, agitation, and filtering (a procedure similar to the Mariner process in Australia) will meet with better results. When, however, roasting forms a part of the treatment in both processes, it seems incomprehensible that the ore can be slimed, cyanided by agitation, and filtered as cheaply as it can be treated by simple chlorination when the ore is crushed to 12 or 16 mesh, especially in view of the fact that the application of electrolytic chlorine is no longer experimental, and can be produced under Cripple Creek conditions for less than four cents per pound. Even this expense will ultimately be eliminated when the caustic soda, which is a necessary by-product in the generation of chlorine by electrolysis, is converted into marketable shape, and made to pay for the chlorine used in treating the ore.

W. E. GREENAWALT.

Denver, September 22.

Who Is a Mining Engineer?

The Editor:

Sir—I have followed, with interest, the discussion in these columns recently, as to what constitutes a mining engineer, and as I had rather a sharp correspondence a few years ago, wherein I pointed out to a person who used the letters M. E. after his name, on the strength of a correspondence course in mining, the impropriety of such use, I shall be pardoned, perhaps, if I express my views in the present instance.

It seems probable that this discussion would not have arisen had there been a good generic name, besides the name which is commonly used to designate the holder of the college degree of Engineer of Mines, for that group of professional men who concern themselves with mines and mining. Among the other professions there is not such ambiguous uncertainty as to who is who—and how; and the reason is that definite tests have been provided which must be successfully met before the candidate can take the title of his profession. Thus: No man can call himself a lawyer or practice law until he has passed the Bar examinations; neither can a man take the title of clergyman until he has been ordained; nor can anyone call himself a physician or surgeon until he has been graduated from a medical school.

In mining, however, there are men who have obtained their knowledge and received their training in many different ways: There are good mine managers who have never seen the inside of a college, or perhaps have never even attended a high school, yet who have, by sheer ability and force of character, acquired the requisites that go to make a good mine administrator. Again there are those who have taken college courses in other things, the Arts even, who have afterward gone into mining, and have made good. Also there are the men who have taken courses in mining at colleges which confer the Bachelor of Arts or Bachelor of Science degrees alike on all of their graduates, no matter how they have specialized. Finally there are those who have graduated from a college or school of mines which gives the degree of Engineer of Mines to its graduates in mining. In all of these classes there are many good engineers, who have a right to professional consideration in any classification of mining engineers as a body, that might be made. As the colleges are turning out an increasing number of men holding the degree of Engineer of Mines, or Mining Engineer, as the case may be, and as these men, while indubitably having a right to the use of their degree, are still, through lack of experience, unready for administrative positions, it seems to me that a just distinction can be made between them and the men who have "arrived"—in this way: Let the raw graduate, until he gets to be a mine manager or superintendent, and while he is still assaying or surveying, or pushing an ore-car, use his title to express the fact that he is as yet merely a degree holder. Thus: John Jones, E. M., or John Jones, Engineer of Mines, Columbia, 1906, would express that idea. After he has been out of college a few years and is in responsible charge of a mining property, let him then, and not before, write his name John Jones, Mining Engineer. If he wishes to express both facts he could write his name John Jones, Mining Engineer, E. M., Columbia School of Mines, 1906.

Let the title, then, of Mining Engineer, thus written out in full, be used by those only who have attained to the responsible, technical administration of mining properties, whether they hold college degrees or not. Let the college men use only their college degrees until they can use the higher term, and let all others who will, call themselves mining experts.

Among the mining men who have specialized along

one line, I think that Mr. J. H. Curle has happily adopted a title both descriptive and good, in that of Mine Valuer, and it is hereby commended to those mining men who devote themselves exclusively to examination work.

Should the matter be of any interest, I can say that I am a graduate in mining from a college of recognized standing, and hold the degree of Bachelor of Arts. Since my graduation I have had the responsible technical administration of mining properties, and consequently sign myself simply,

A MINING ENGINEER.

Telluride, Colorado, September 19.

Who Is a Mining Engineer?

The Editor:

Sir—As there are no statutes defining the status of a mining engineer, the public should have some idea of what the term means. The definition I propose will no doubt be sneered at by a class of practical men who imagine an engineering education is a *sine qua non* of everything impracticable, and in this they display as much ignorance as the young graduate does when "he thinks he knows it all." A 'mining engineer' is one who takes a diploma from an institution making a specialty of mine engineering. Any other person, no matter how well qualified, is not a mining engineer, or the designation loses all significance. He may be a 'mining expert' or anything else, but not a 'mining engineer.'

ALGERNON DEL MAR.

Oroville, Cal., September 15.

De-Suplhurization.

The Editor:

Sir—In 'Pyrite Smelting,' edited by T. A. Rickard, one of the ten questions propounded by him was: What is the degree of desulphurization attainable? it being understood that the treatment of sulphide ore was meant. The question as to how much of its contained sulphur could be burned off, when resmelting matte for concentration, was not referred to, and I would therefore propose the question: What degree of desulphurization is attainable in the concentration of matte? This question is the more important, since in the older practice of matte-smelting with the use of 10 to 14% coke, it was understood that raw matte, put through the furnace, issued thence unchanged. Peters says that "in the powerful reducing atmosphere of the blast-furnace, the sulphurous acid, even when once formed, comes in contact with an overwhelming proportion of CO, which in burning to CO_2, decomposes the SO_2 reducing it to sulphur, in which condition it unites with iron or copper and enters the matte, thus increasing the amount of this product while it robs the slag of its most valuable constituent."

In 'Pyrite Smelting,' W. H. Freeland, in the chapter entitled 'Raw Sulphide Smelting at Ducktown (Tenn.),' makes a concentration of his matte 2.5 into one and adds: "This by no means represents the limits attainable. Contrary to the experience of many, the re-concentration of the first matte presents no difficulties at Ducktown. There is no limit within the range of matte to the second operation. A 6% matte may be brought up to a 50% matte quite as successfully as any higher grade initial matte, nor is this based upon odd or occasional samples, but upon more than one car-load of matte so made." The just-named concentration of 2.5 into one was effected in presence of 5.6% coke, so we can only assume that an overwhelming amount of air was present—enough to produce an oxidizing effect. And this appears to be the secret of success in such concentration.

J. Parke Channing, on page 260 of 'Pyrite Smelting,' gives the result of two runs of low-grade matte, giving concentrations of 4.8 and 4.4 into one, respectively, with the use in the first case of 4.5% coke and in the second of 3.5 per cent.

Whether these results can be got elsewhere is a question. In the Salt Lake valley, for example, they attain a concentration of 3 into 2 and of 2 into 1, at the most.

L. S. AUSTIN.

Berkeley, Cal., August 18, 1906.

Machinery Merchants and Metallurgists.

The Editor:

Sir—We are constantly hearing of industrial plants that have lamentably failed. Among all the pathetic monuments of incompetency and misjudgment, the abandoned or dismantled ore-mill is perhaps the most common; and nothing, in later years, has brought so much discredit upon the profession of the metallurgist. The chief causes of these failures are the lack of ore supply and mistakes in installation for which the amateur metallurgist is responsible. But there is another cause, not so obvious and generally recognized, and that is the gradual intrusion of mining-machinery houses into the special field of the metallurgical engineer. The sophisticated mine-owner is not likely to intrust his milling problems to machinery firms; but there is a numerous class comprising prospectors and promoters in process of transformation into mine-owners, engineers, and 'experts,' who instinctively flock to the machinery houses for direction and advice. A common lure is the ore-testing plant that some of these firms operate as an annex to their machinery business, thus assuming the ability and the right to give professional advice. To the novice incapable of judging the merits of a machine or a process, a little glib talk, and a superficial exposition of what a machine will do, carry instant conviction. It is inconceivable that mine-owners and companies will plunge headlong into fatal mistakes by ignoring the one supreme truism so patent to the engineer—that the man who has a machine to sell is the last one to appeal to for advice! The business of such a man is to sell his machine, and the business of machinery houses is to sell the machinery of which they are the manufacturers or agents. The result often is that the plant installed by a machinery house is either a failure or a monstrosity; and the machinery merchant, with the subtlety of his kind, somehow contrives to elude the responsibility, and goes on his way rejoicing. The hesitation on the part of companies or individuals to employ only disinterested and skilled professional service in the examination of the properties and in the selection of their milling processes, is a subject which is being so emphatically rehearsed in current mining literature, that it seems almost unnecessary to touch upon it again. The incredible thing about such advice is that it should be necessary at this late day to offer it at all. And yet the penalty of disregarding it is still glaringly manifest in whichever direction we turn, and the examples of it are constantly multiplying.

W. H. L.

New York, October 2.

AT the Victoria Quartz Mine, Bendigo, the sinking of the shaft has been completed to the great depth of 4,300 ft., and the mining inspector has visited the mine and taken observations. He found that at the plat at 4,020 ft., the temperature was only 76° F., while at the same spot there were 10,000 cu. ft. of air per min. passing through the cross-cut. At the bottom of the shaft the temperature was 86°, and the water running out of the ground registered 114 degrees. There was also a slight circulation of air at the bottom of the shaft.

Three Weeks in Mexico.---VIII.

Concluding Notes on El Oro.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Dos Estrellas, or the Two Stars, is one of the three great mines of El Oro; it is interesting not only because of its generous production but also by reason of the romance of its discovery. J. G. Fournier, its present chief owner, is a Frenchman of education who prospected the region roundabout with much persistence. He found 'float' (detached lode-stuff) where the shale is exposed below the andesite cap and he found similar indications also in the *barranca* (or gulch) at the foot of the mountain. Subsequently, he started to work at the creek level and ran a long adit to intercept the vein that he believed to be there. At a distance within the mountain of about 2,000 ft. he found it, and no mistake. It was the great Dos Estrellas lode, which is divided into two veins, one 3 to 5 ft. thick, with rich bodies of ore in it, and beyond it another vein 40 ft. thick of 12 dwt. gold ore; the latter is oxidized, but the small vein is not, except in patches. This resembles the conditions in the Esperanza, where the new West vein is smaller, richer, and unoxidized, while the old San Rafael is wide, poor, and thoroughly oxidized. Fournier was long ago regarded as a crazy man, as has been the case in several similar instances of persistent prospecting. Thomas Kruse who discovered the Drumlummon lode, at Marysville, in Montana, worked all alone. He started to sink a winze and gave it up; he then commenced to dig a 'tunnel' for a supposedly unknown lode. When he cut a big width of ore, it was considered, by the ignorant, as fool luck. But it was nothing of the kind; old Tommy Kruse had found an outcrop and he knew that he alone could not sink a shaft, but he could drive a drift into the hill without assistance and without the risk of sharing his discovery. He persisted in his solitary labors, and won a fortune.

The ordinary unskilled laborer — such as is required for carrying material, for unloading, for stacking cord wood, or in excavating for foundations — is paid 50 centavos per day, but it is becoming difficult to get men for such pay. In a new mining camp or on the farm, the day laborer is paid only 25 centavos, while in the north, near the border, he gets three pesos. This is owing to the proximity of the American labor supply and the competition between the mining companies, the wages tending to equalize despite the international boundary, because both the northern workmen and the Mexicans go across that line, to and fro.

As much as possible of the work underground is done on contract; even the trammers and skipmen are employed on this system, prices being set so that the miners earn from 1 to 1.25 pesos per shift. In measuring ground under contract, the unit is a width of two sets (3.4 metres) of timbers, and the pay is so much per metre long for the full height of a set (two metres). Mine contracts are made with each gang of six men or more, the agreement being arranged with the two leaders (one to watch the other); and these hire any additional labor such as is needed for removing rock or tramming. Contracts are measured weekly, on Saturday night. Wages also are paid weekly, the surface laborers on Saturday night and the miners on Sunday morning; this frequency of payment being due to the fact that the *peones* have not enough money to carry them longer than seven days. On Sundays the market is crowded with vendors of corn (maize, from which *tortillas* are made), beans (the *frijoles*), vegetables and fruit. The Mexicans lay in a week's supply; any money remaining is spent on *pulque*. On Monday they are in a demoralized state. Owing to these customs, the laborers lose two days per week regularly, besides an extra feast day (*fiesta*) each month. But annoying as these conditions are to an energetic management, they are better than they used to be. Even on local holidays, the *peones* formerly took three days for their celebration, while now one day ordinarily will suffice. But there are still seven or eight *fiestas* in the year when no pretense of working is made, and operations underground cease. Of course these national characteristics of the Mexican do not affect — at least directly — the American workmen; they are paid



A Group of Mexicans at Work.

monthly, and appear to be not only sober in their habits, but also unusually efficient.

Mexicans take kindly to mechanical labor, such as that of the machine shop or carpentering. The average native carpenter, who gets from 2 to 4 pesos per day, is as good as the white men of his trade that drift into the country from the north. Timbermen are fairly satisfactory also; they receive two pesos per shift. As a rule, the Mexican is clever with his fingers, as is illustrated in the shaping of statuettes, and in weaving. Guadalajara is famous for carved images and Cuernavaca for the manner in which its people mold clay into statuettes and flower pots.



Pay-day at the Casa Blanca.

The assay crucibles used in El Oro mill are made locally; so also the muffles. The crucibles, sizes F and G, holding 2 A. T. assays, cost only two centavos apiece and give excellent service.

In different parts of Mexico the skill of the miners will vary; at El Oro it is less than at Pachuca. The cost per ton of ore is not much cheaper than if done by skilled white miners. Mexicans are not miners by instinct; as long as they can maul at a face and detach chips of rock, they will hammer it, instead of picking it loose or putting in a shot. They are wretched hammer-men; a Cornishman who watched them would be inclined to say that it was a "caution," and the American miner would exclaim that it was a "fright." They do not appear to have any of that body swing, when the hand slips over the long handle of the hammer; instead of this, they have a tight grip and strike short blows over the shoulder; they will insist in shortening the hammer-handles; nor do they use the pick where obviously it would bring down loose ground, but they worry the rock with short hammer-blows delivered with woodpecker persistence. Their hammer-heads get into woeful condition and their picks are rarely such as a white man would care to own; in general, they appear to take poor care of their tools. Owing to their inability to swing the hammer freely over the shoulder, they cannot drill an upper and therefore they are not much good in a raise; but they are 'daisies' in a winze. At the south end of El Oro mine, I saw some Mexicans sinking a winze below the 286-ft. level and they were down over 80 ft. on a dip of 65°. All the rock they broke was being carried in sacks on their back from the bottom of the winze to the level, and they were being paid 15 to 20 pesos per metre for a winze 3 ft. wide by 6 ft. long. In the Mexico mine, winzes 5 by 6 ft. cost 25 to 30 pesos per metre. The shift-bosses in the Esperanza mine are mostly Italians (Piedmontese), they are among the best miners in the world and learn Spanish readily; in a month they acquire a working knowledge of the language and they seem to know how to manage the *peones*. Most of the Piedmontese in Esperanza come from Bisbee, simply because the foreman worked there at one time.



Drilling in a Rich Stope.

Boys are employed underground for minor tasks, such

as doing errands, carrying water, and cleaning tracks. They are only 8 to 10 years of age. On the whole, the full-grown men are not well built, they have the physique of a big boy rather than that of a mature man; their strength is all in the back, the muscles of which have been developed by generations of burden-carrying. They can transport enormous loads on their back, but are incapable of carrying any weight in their hands.

At the Esperanza there are 3,952 men employed; scarcely three per cent are whites. For some tasks it is necessary to use four or five Mexicans to accomplish what one white man could do, but on other jobs the Mexican will do what the white man cannot do at all, especially as regards carrying loads. The Mexican will often serve where a mechanical device would cost more.

They work naked save for a loin cloth and sandals (*guaraches*), for the air underground is very warm. On the second level of the Mexico mine it was 85°; in the shaft (owing to steam pipes) fully 100° F. In the cross-cut from the 286-ft. level going west from the Somera shaft the temperature was 95°, and in the cross-cut, at 1,086 ft., it was up to 105° by reason of poor ventilation and escaping steam. The general temperature in the workings is 60° to 70°. The heat is due largely to the action of water on the lime in the shale—slaking it—and it may be due also to the crushing of the shale, which is often seen to press heavily on the timbers.

The authorities keep a close grip on the native population. Strikes are rare. They occur occasionally in the cyanide plant, where the men that tram the sand are inclined to think that they do too much. El Oro has never had a big strike. Should there be any disorder or insubordination requiring serious action, the *Jefe Politico* (sheriff) is asked to call out his *rurales* (police) and these arrange affairs by capturing the ringleaders, after which the crowd scatters at once. The *peon* is an inveterate thief; the mill-hands steal ore and the precipitate in the zinc-room whenever possible. When caught in the act, the culprit is turned over to the *Jefe Politico* and in short order the latter sentences him to serve in the army. He is made a compulsory soldier and may be drafted to the hot country of the Yucatan peninsula, which is equivalent to exile. To put the *peon* in prison means nothing to him; he has a quiet time, his friends bring him food, he is required to clean the streets or to do similar municipal work; it is no punishment to him; but to be placed in the army means wailing and the gnashing of teeth among his friends.

Even the operation of a cyanide plant may yield humorous incidents. A note-book belonging to one of the former assistants was found; it recorded the work done on the night shift in the precipitation room. The particular fragment rescued from fire contained instructions how to pump out the precipitate-sump and to make cake in the press. The operator, a new hand, had recorded that at a certain hour "pump laboring—opened press to see why—found press choked with greasy black substance—removed same—pump worked perfectly." He threw the precipitate into the old (empty) cyanide boxes, where it was found next day; no damage was done. Another story is that of visitors being shown over the new mill by a guide from the village of El Oro; he pointed to the tailing wheel, which is 40 ft. 8 in. high, and said that it was the wheel that operated the mill, the conveyors, and everything in sight. This wheel is run by wire ropes; there are two that transmit movement to the wheel itself, there are four that drive the first line of agitator-shafts, and there are two more that go to the pumps; all of them happen to be close together and doubtless the number of ropes created the idea that the wheel was responsible for a great multiplicity of duties.

The only salvation for land titles is due to the regulation which compels monuments to be visible from one to the other. By law also it is specified that the monuments must be permanent stone structures; otherwise there would be hopeless confusion, for the records in the mineral-land offices would be unintelligible, because there is no general map and the boundaries of claims are not referred to any fixed point or landmark.

The boundaries between the Esperanza and El Oro mines are marked by posts of masonry plastered with white mortar; they are set at each corner of a claim and where the lines are long they are placed at such intervals as to be within sight from one to the other. The local inhabitants, some of whom thought they had squatter's rights to the ground, started to demolish these monuments until the company's surveyor marked, with black paint, a cross on each one; since then they have been reverently left untouched. Similar superstitious feeling is seen in other observances. Wherever a man dies—whether naturally or not—a cross is set up, even underground in the mine; and each man who passes by picks up a stone, which is supposed to represent a paper, and drops it at the place so designated. On the day of the Holy Cross every cross in the country is decorated with flowers, even artificial ones if others are not procurable. By the heaping of stones at such spots, a cairn is eventually formed, serving as a landmark. At the place where a priest was killed, near the Somera shaft, there is an enormous pile of stones.

In the course of a ride on horseback over the surrounding district, on a Sunday, one can observe something of the life of the people. There is a notable absence of vehicular traffic; there are no ruts in the roads, which practically are causeways, worn smooth by the sandals and bare feet of the peasants; the paths look as if all the 'weary Willies' in the world had passed that way. The beauty of the scenery and the picturesque coloring of the people is spoilt by the evil smells due to the filthy habits of the *peones*. At the close of day, when the tropic darkness comes swiftly and the air is suddenly cooled, the Mexicans stalk about silently muffled in their *serapes* and with covered mouth, in order not to inhale the air. It is a characteristic of the people that they fear the cold air, largely because they are so poorly nourished as to be easily subject to pneumonia. With their wide-brimmed conical hats, the dirty red blanket or the striped *serape* thrown over the shoulder, with thin shank and stealthy gait, they stalk about in the gloaming through the narrow street like the brigands of an *opera bouffe*. There is none of the breezy swing or the cheerful salutation of the Anglo-Saxon; nor is this a matter for wonder when one gets to know the miserable life, the petty tyranny, and the scant food that is their lot. Cleanliness, good food, and freedom of opportunity make people more cheerful even in a climate less sunny than Mexico.

Nothing that I saw in Mexico seemed so pathetic as the conventional acceptance of class distinctions, especially among the women, the sex usually most eager to ape the dress and habits of those who happen to be more favorably placed than themselves. The lowest class wears blue and brown shawls (*rebosos*), the middle class is distinguished by black *rebosos* and the upper class sports the more dainty *mantilla* or mantle of lace.

The most vivid impression that I took away from El Oro was that of a Mexican boy controlling the operation of a sand distributor through a variable-speed motor. The boy's pay was 75 centavos, or 37c. per day, and he had charge of two Blaisdell excavators and the distributor referred to. It was a picture of mechanical ingenuity overcoming a poor labor supply, for it was not the skill of the boy so much as the perfection of the machine that rendered such economy of operation possible.

About Mineral Belts.

Written for the MINING AND SCIENTIFIC PRESS
By THEO. F. VAN WAGENEN.

Some ten years ago, and in the pages of the *School of Mines Quarterly* (Columbia University), I called attention to the fact that all the metal-producing centres of the western part of the United States (excepting placer districts), from the Plains to the Pacific and from the Canadian to the Mexican lines, lay along about a dozen narrow belts of country, all parallel to each other, with a general direction northeast and southwest, and with widths ranging from 10 to 20 miles. Accompanying the article was a map showing these belts, a photographic reduction from one six feet square. The former proved to be upon too small a scale to exhibit details properly, and the latter was shortly thereafter accidentally destroyed. Since then I have never had the leisure to reproduce it.

In this large chart the outlines of the several belts that passed through the State of Nevada gave much trouble, and were not satisfactorily defined. There was a tendency, as I then had them, to unite with each other quite improperly, or to merge into one very broad belt, to the practical destruction of the belt theory in that locality. I have since ascertained that this was due to errors and defects in the Nevada map, a large number of the mining centres having been incorrectly marked. This condition of inaccuracy is true to a greater or less extent of the maps of all the Western States. But having corrected many of the worst errors, I am thoroughly satisfied that, if an accurate map were made of the West, all primary metal producing regions would be found disposed along a dozen well defined lines, stretching like gigantic lodes diagonally across the country from the Plains and the Canadian border to the Pacific and the Mexican line.

During the last four years opportunity has been afforded to ascertain whether similar physical conditions existed in other parts of the world. Three years have been spent in South Africa, and one in Mexico, and in this period nearly all the known mineral districts of both have been visited. About the first thing I noted was that the maps, like those at home, were inaccurate as regards the position of most of the small towns. This was to be expected, as in neither country have the governmental surveys been carried forward sufficiently to afford a fair basis for cartographical work. Nevertheless, in both the position of the principal mineral centres have been well ascertained, and when these were marked on the map, as red dots, and the little ones put in as fast as their true position was known, it became evident—as might have been expected—that nature had worked in these parts of the world in the same way as in the United States. In Mexico, from the international boundary down to the Isthmus of Tehuantepec, there are at least 16 well defined lodes or mineral belts crossing the country from the northeast to the southwest, all parallel to each other, and none more than 25 miles wide. Between them, just as with us, are strips from 100 to 125 miles wide, where no mining districts exist, and no metals have been found. As Mexico has been in the hands of the prospector for nearly 500 years, this is a most significant fact. In South Africa, four belts are easily traceable, each presenting the same characteristics as those on the American continent, and if the modern prospector is ever allowed to work in that region, no doubt he will unearth many more of them.

It is likely that the conditions in other parts of the world are the same as in the North American continent and South Africa, and if so, there is a meaning to it all, that, if understood, is liable to be not only of scientific interest, but of commercial importance. In my first article on the subject, working with defective maps, and confining observations wholly to the Western States, it seemed as if these belts showed a tendency to conform, in the matter of direction, to the lines of magnetic variation. But later and more detailed examination dispelled that idea. As far as I have now re-constructed the original chart, these belts show a uniform course of almost exactly northeast and southwest, just as is the case in South Africa and Mexico.

The reader who is interested in the subject will please remember that, while in every case within the borders of the United States, it is possible to trace a belt from the Plains or the Canadian border, to the Pacific or the Mexican border, according to the position it occupies on the map (as, for instance, the long one beginning in the north in the Black Hills of South Dakota and passing into the ocean a little north of San Diego), yet there are parts of each belt where the line passes out of mountain regions into and through extensive agricultural areas, or areas of very modern rock formation, and such parts generally lack mining districts. Nevertheless, I think it will be proved in time that the belt or lode persists underneath both. In all cases it appears beyond in good line, and there are several instances where, within such non-mining regions there are isolated upheavals of the underlying deeper formations. In those that are on the proper line, deposits of the metals have been found, while none occur in those off the line.

Taking the example of the Black Hills–San Diego belt or lode, if its line is prolonged northeastward it leads directly to known mineral districts in Canada. The course of one of the South African belts disappearing under the Indian Ocean, passes directly through the Mysore goldfields of southern India. Coming nearer home, the principal New Mexican belt, which is clearly defined, can be followed through an almost continuous line of mining camps in Chihuahua and Sonora to the Gulf of California, and then appears again in full strength in the narrow peninsula of Lower California. To the northward its line, dipping under the prairies of Kansas, Nebraska, South Dakota, and Minnesota, leads directly to the Rat Portage mining district in southern Manitoba. In other words, these belts seem to be continuous lines of metallic mineralization, whose course it may be possible to trace clear around the globe.

Some conclusions of interest and value can probably be drawn from the statements above given, and after that is done, if one wishes to speculate, there is ample scope for the imagination. The facts seem to be about as follows:

1. Primary deposits of the metals in the crust of the earth occur along certain well defined lines, which (diagonally or spirally) encircle the globe in a general northeast and southwest direction, are from 5 to 20 miles wide, and have all the general characteristics of gigantic lodes or veins, being in some places well laden with ore (*en bonanza*), and in others nearly barren (*en borrasca*). The former are the rich and prosperous and payable mining districts along their line, and the latter are the non-payable areas, where only traces of the metals are found. Intermediate are all the intervening degrees of mineral segregation and concentration, which are payable or not, according to the economic conditions prevailing.

2. Between these great belts or lodes are areas averaging 100 miles or more in width, which are entirely devoid of primary metallic mineralization.

As conclusions from these, it would seem that metals do not occur in the earth's crust as the result of the existence or juxta-position of certain rocks, or classes of dikes, or plutonic intrusions, that have heretofore been considered favorable for their segregation and concentration.

Nor has the trend or rock-structure of mountain chains much, if anything, to do with the determination of their locality, for these belts cross the lines of mountains at all imaginable angles. At the intersecting places the latter are mineralized. Elsewhere they are barren. As these mineral belts are invariably—as far as my observation goes—a little bent out of their normal direction in passing through a mountain range, it would seem as if the systematic mineralization of the crust of the globe must have occurred before the era of mountain building. Finally, there are certain regions where the prospector will be wasting his time in searching for ore, and others that appear—so far as surface indications go—to be of no account from a mining standpoint, but which are really first-class prospecting areas.

Some effort should be made by the Geographical Survey to indicate on maps the approximate boundaries (in the United States) of these two classes of territory, for the guidance of the miner. It would have the effect of doing away with some of the hazard and uncertainty of the prospecting and mining occupations.

Now as to speculation. If the globe is encircled with a continuous spiral of metallic mineralization, or a series of parallel circles of the same, like the soft iron core of the telegrapher's magnet, this metallic wrapping—so to speak—may be the cause of its magnetism and polarity. Or, to look at it in another way, these metallic channels should be the lines along which travel electrical currents of more than normal strength, and they may have had much to do with the segregation of the minerals into bonanzas and ore-shoots. If so, the electrical tension in deep mines is worth investigation. If electrical currents determine the situation and size of orebodies, and we can gain a knowledge of the way they operate, that knowledge promises to be of assistance in ascertaining the position of bonanzas yet undiscovered.

LARGE CHECKS.—A boast came out of the West last week. "What is said to be the largest check issued in ten years," it read, "was drawn by Banker Hellman at San Francisco to close the Spring Valley water deal. The check was for $13,792,000."

The California correspondent ought at least to have been familiar with the $40,000,000 paid by the Government to J. P. Morgan & Co. in the matter of the Panama Canal purchase. This sum, however, was not, strictly speaking, in the form of a bank check. It was transferred from Washington by Treasury warrant ordering the Assistant Treasurer at New York to pay $40,000,000 to the order of J. P. Morgan & Co. The New York Clearing House, however, has record of enough big checks drawn in recent years to put the California record in the shade without falling back on this Government payment. The organization of the Steel Trust in 1901 furnished the necessity for the largest check on record, which was drawn by J. P. Morgan & Co. in payment for the Carnegie steel plant. The amount was $23,127,016.67, and the check was drawn on the First National Bank, with which it was deposited Feb. 15, 1901. It did not pass through the Clearing House. Next in order stand two checks, one for $17,000,000 and the other for $17,500,000, both of which were drawn by Kuhn, Loeb & Co. on May 25, 1900, to the order of Hugh J. Grant, receiver, in payment for the Third Avenue Railroad when that property was acquired by the Metropolitan Street Railway Co. The first of these checks was drawn on the National Bank of Commerce and the other on the National City Bank. They were both deposited with the Morton Trust Co., which put them through the Clearing House. Still another check which the New York Clearing House officers thought large enough to make a memorandum of was one for $14,890,697.40, which Kuhn, Loeb & Co. drew in payment of 50% of the purchase money for the controlling interest in the Southern Pacific acquired by the Union Pacific in 1901. This check came into the Clearing House March 5, 1901, in the exchanges of the Bank of the Manhattan Co., which clears for the United States Trust Co., where the check had been deposited. It was drawn on the Mercantile Trust Co. and was paid by the Fourth National Bank, which was the redemption agent of the Mercantile Trust Company.—*Boston Financial Journal.*

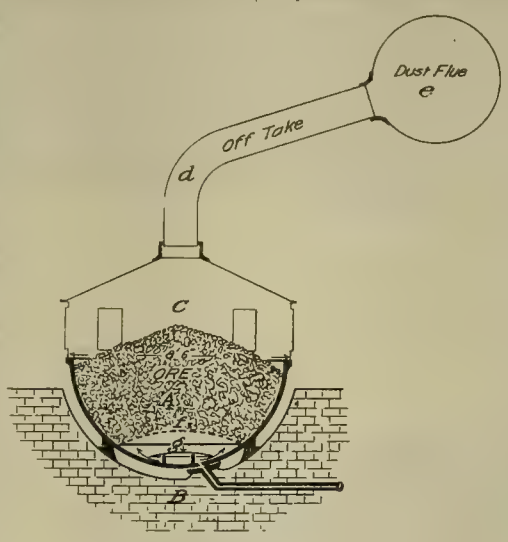
THE MARINER'S COMPASS.—Much interest must forever attach to the discovery of this instrument, and yet there are few subjects concerning which less is known. For a period the honor of the invention was ascribed to Gioia, a pilot born at Pasitano, a small village situated near Amalfi, about the end of the thirteenth century. His claims, however, have been disputed. Much learning and labor have been bestowed upon the subject of the discovery. It has been maintained by one class that even the Phœnicians were the inventors; by another that the Greeks and Romans had a knowledge of it. Such notions, however, have been completely refuted. One passage, nevertheless, of a remarkable character occurs in the work of Cardinal de Vitty, Bishop of Ptolemais, in Syria. He went to Palestine during the fourth crusade, about the year 1204; he returned afterward to Europe, and subsequently went back to the Holy Land, where he wrote his work entitled 'Historia Orientalis,' as nearly as can be determined, between the years 1215 and 1220. In chapter XCI of that work he has this singular passage: 'The iron needle, after contact with the loadstone, constantly turns to the north star, which, as the axis of the firmament, remains immovable, while the others revolve; and hence it is essentially necessary to those navigating on the ocean.' These words are as explicit as they are extraordinary; they state a fact and announce a use. The thing, therefore, which essentially constitutes the compass must have been known long before the birth of Gioia. In addition to this fact, there is another equally fatal to his claims as the original discoverer. It is now settled beyond a doubt that the Chinese were acquainted with the compass long before the Europeans. It is certain that there are allusions to the magnetic needle in the traditionary period of Chinese history, about 2,600 years before Christ; and a still more credible account of it is found in the reign of Chingwang, of the Chow dynasty, before Christ 1114. All this, however, may be granted, without in the least impairing the just claims of Gioia to the gratitude of mankind. The truth appears to be that the position of Gioia in relation to the compass was precisely that of Watt in relation to the steam engine—the element existed, he augmented its utility. The compass used by the mariners in the Mediterranean during the twelfth and thirteenth centuries was a very uncertain and unsatisfactory apparatus. It consisted only of a magnetic needle floating in a vase or basin by means of two straws on a bit of cork supporting it on the surface of the water. The compass used by the Arabians in the thirteenth century was an instrument of exactly the same description. Now the inconvenience and inefficiency of such an apparatus are obvious; the agitation of the ocean, and the tossing of the vessel, might render it useless in a moment. But Gioia placed the magnetized needle on a pivot, which permits it to turn to all sides with facility. Afterward it was attached to a card, divided into thirty-two points, called Rose de Vents, and then the box containing it was suspended in such a manner that, however the vessel might be tossed, it would always remain horizontal.—Quoted by the *Electrical Engineer* from an old magazine.

The Pot-Roasting of Ore.

Written for the MINING AND SCIENTIFIC PRESS
By LEONARD S. AUSTIN.

This method of preliminary treatment is essentially a roasting process, performed in large pots or semicircular kettles capable of holding ten tons of ore. The method has also been called the Huntington-Heberlein (H & H) process, but in that process, as patented, ore containing 30% and upward of galena was blown with the addition of limestone in quantity sufficient to prevent premature agglomeration, but rather a sintering, which would make the product suitable for the following operations of smelting. As the process was developed in the United States it was soon found that ore of a much lower tenor in lead might be profitably treated and in which no limestone was needed.

The plant consists of a building having a central nave or bay which contains one or more rows of pots all commanded by a traveling crane. On one or both sides of this nave are to be found the aisles or side bays where are situated Godfrey single revolving hearths roasting furnaces having a capacity of 20 to 25 tons daily and where the ore is roasted without the use of exterior fuel to a contents of 12 to 14% sulphur. An objection has been made to this type of roaster as now designed that lubrication is unsatisfactory owing to the high temperature at the bearings below the hearth. The central bay is extended so that the roasted ore may be dumped beyond the space allotted to the pots.



Pot-Roasting of Ore.

An ore mixture for roasting is now commonly made up containing no more than 7 to 10% lead, 30% silica, and 20 to 25% sulphur, silicious ore being added to mixed sulphide in such amount as to secure these proportions. The addition of this dry ore has the effect of making the mixture more infusible, and of preventing the particles from running together. The ore, even when agglomerated, still retains its open texture and is capable of penetration by reducing gases in the blast furnace.

Fig. 1 represents a pot A of eight and one-half feet diameter placed in a pit B and connected at the bottom by a tuyere to an air-main by which air may be introduced to the pot under pressure. To carry off the gases which are developed a hood or cover C is lowered upon the pot when it has been charged, this being connected by an adjustable branch pipe d to the flue e. The pot has a cast-iron false bottom f perforated with 0.375-in. holes through which the blast enters and a baffle-plate g which serves better to distribute the air-blast.

In operation, a barrow-load of ashes is sprinkled upon the false bottom, forming a thin layer to prevent the sticking of the charge. In certain practice, in place of the ashes, some limy lead-free ore has also been successfully used. The ore thus in contact with the false bottom is but little affected by the heat, so that the limestone is not burned to quick-lime. Upon this layer is dumped a quantity of upward of a ton of hot roasted ore, which serves as a means of starting fire to the ore added upon it.

On the hot ore is dumped, in some cases, no more than two tons of the regular charge or mixture, which contains five per cent or more of water, and which has been roasted down to 12 to 14% in a Godfrey roaster, a single revolving-hearth furnace of 20 ft. diam. When the two tons have been well started the rest is then added. An important requirement seems to be that the ore thus to be treated shall be moist. It may be considered that under this condition the moisture forms with the forming SO_2 gas a proportion also of H_2SO_3, which tends to rapidly corrode the off-take flues or pipes where they are of sheet-iron, and the hoods also.

In other practice, the whole charge of 8 or 10 tons is added at once and the air-blast turned on at a low pressure of an ounce or two at first, but with about four ounces pressure later on when the ore has become more sintered together and thus impedes the passage of the air through it. The moistened ore takes fire from the hot ore first put in and slowly burns upward through the charge. Wherever it seems to be coming through more freely it is poked and covered with fresh ore so that it may be driven to come up elsewhere.

The ore soon becomes hot and glowing throughout its mass and over its surface, and sulphurous fumes are freely given off. Hinged doors at the sides of the hood give access to the interior for inspection and for poking the charge. The whole charge having burned through and the gases having in large measure ceased to coke off, the hood is removed and the pot is picked up by a crane and removed to the dumping-floor at the end of the building. Here it is inverted and the contents of the pot falls out upon the floor. Whenever any of it sticks it is cleaned or burned off, and the pot is returned to its pit for the next charge.

In the intervals between handling and charging the pots, the crane is occupied in handling the large lumps of ore putting them through a Blake crusher 24 by 36 in. in size. It is surprising to see how large lumps may be put through this crusher. Even where one end is inserted between the jaws with a little coaxing and sledging the pieces are soon put through. From the crusher the broken, and now thoroughly roasted ore is loaded to cars and transferred to the charging-floor. The roast is variable and ranges from 1.5 up to 5% in sulphur. With care practically all the ore is agglomerated. In those cases where this fails, as it sometimes may, the fine ore is moistened and mixed into the next charge.

The advantages of the process are :

1. The mechanical condition of the ore is such as to make it very acceptable to the blast-furnaces.
2. No fuel is needed in the operation.
3. The volatilization loss is practically nil while in ordinary roasting, and especially when the ore is agglomerated there is an appreciable loss. The loss in the Godfrey roaster is also nothing, since it is not carried free, and for the same reason the tonnage roasted is large. The costs of the operation are low since the material is handled mechanically and those costs are reduced with a larger number of pots used. The process, the rights to which in the United States have been purchased by the American Smelting & Refining Co., is coming into increasing use at their various plants.

The Action of Oxygen in Cyanide Solutions.

By H. JULIAN.

*A doubt has for some time existed as to the accuracy of the generally accepted idea that free oxygen is primarily essential for the dissolution of gold in cyanide solutions, according to the equation:

$$4KCy + 2Au + O + H_2O = 2KAuCy_2 + 2KOH.$$

Experiments are described which go to show (1) that free oxygen plays no primary part in the reaction, (2) that any assistance given by free oxygen is of a secondary nature, and (3) that free oxygen exerts a retarding influence.

The experiments show that the galvanometer points to the presence of free oxygen as having a retarding influence on the dissolution of the gold, whereas the balance points to it being of material assistance. The cause of the two instruments not agreeing is discussed, and is attributed to the formation of local voltaic circuits. These, in the first instance, deposit hydrogen and oxygen, which, it may be assumed, becomes occluded at their respective electrodes until the systems are in equilibrium. It is pointed out that the cyanogen leaves the solution to combine with the gold rather than that gold particles pass into the solution, and it is shown that cyanogen does not leave the solution until the deposited oxygen has been occluded to a certain degree of concentration. The reason for this is that the expenditure of energy necessary to remove oxygen from the solution is less than that necessary to remove cyanogen; but when oxygen is occluded to a certain concentration, the expenditure of energy then necessary to cause the metal to occlude a further amount becomes as great as that necessary to begin to remove cyanogen from the solution. The available energy is obtained from the metal and solution, and it follows that when the solution is very dilute the available energy is too small to remove cyanogen, oxygen being then alone deposited. From this it may be conjectured that no metal actually combines with cyanogen until the solution has a certain minimum strength.

The presence of dissolved oxygen in the solution has a secondary effect in the process of dissolution, by oxidizing the occluded hydrogen produced through the action in the local voltaic circuits. This results in upsetting the equilibrium, and introducing into the circuits concentration gas cells, which soon bring about equilibrium again, but this time with oxygen at both electrodes at different concentrations, instead of hydrogen and oxygen. If, now, excess of dissolved oxygen diffuses to either of the electrodes the equilibrium is again upset, and an E.M.F. is generated by the gas cell in opposition to the E.M.F. generated by the metal couple; the net result being, of course, a current in the direction of the greater E.M.F. As the strength of the solution increases after a certain point, the E.M.F. due to the metal couple increases rapidly, whereas that due to the oxygen-concentration cell remains constant or increases only slowly.

The increase in the E.M.F. of the metal couple appears to be largely due to the formation of AuCy, a compound having a high potential, which acts as an electrode. This deposits in films, varying in density or thickness to a maximum with the strength of the solution. A couple results of Au-AuCN. After this stage of the process, when AuCy is formed, oxygen ceases to exert an influence. That is to say, the metal passes into solution by the AuCy dissolving in the potassium cyanide solution, as one salt dissolves in the solution of another.

The effect of the gas cell is best observed in highly dilute solutions at ordinary or low temperatures. After a certain strength is attained, dependent on temperature, the effect of the gas cell is entirely masked. At the higher temperatures the E.M.F. of the gas cell diminishes, with a corresponding increase in the E.M.F. of the Au-AuCy couple. At boiling point the retarding oxygen effect of the gas cell on the dissolution of the metal practically disappears.

*Abstract from *British Association Report*, prepared by the author and published in the *Journal* of the Chemical, Metallurgical and Mining Society of South Africa.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The specimen from Tombstone, Ariz. marked A. G. contains galena.

The mineral from Los Angeles, marked J. F. J. is black Tourmaline, of no value.

The nodules from Yavapai county, Arizona, marked C. W. N. are impure lime carbonate.

Specimens from Barstow marked C. K. are: No. 2. Epidote; No. 3. Garnet; No. 6. Rhyolite.

The black sand from Douglas Flat, Cal., marked J. M. E. is mainly Ilmenite mixed with quartz, garnet, zircon, and other silicates. No telluride.

The rocks from Phoenix, Ariz., marked W. L. H. are: No. 1. Sericite schist; No. 2. Altered feldspar; No. 3. Red jasper; No. 4. Quartzite; No. 5. Rhyolite; No. 6. Graphitic coal; No. 7. Black jasper; No. 8. Quartzite.

The minerals from Atwater, Cal., marked J. M. D. are: No. 1. Calcite; No. 2. Quartz and pyrite; No. 3. Pyrite, oxidized; No. 4. Chalcocite, cuprite, malachite, and azurite; No. 5. Pyrite, oxidized; No. 6. Melaphyr rock.

The tentative classification of the rocks from San Isidro, Honduras, sent by C. B., without a microscopic determination, is: No. 1. Andesite; No. 2. Basalt; No. 3. Basalt somewhat metamorphosed; No. 4. Basalt; No. 5. Altered andesite or melaphyr; No. 6. A contact metamorphic rock; No. 7. Altered rhyolite; No. 8 and 9. Contact metamorphics; No. 10 and 11 Andesite or basalt; No. 12. Altered andesite; No. 13 and 14 Altered rhyolite.

As a precautionary measure many of the large Austrian mines are equipped with a 'rescue chamber.' The excavation so named is a kind of strong-room underground, stoutly timbered, with only one entrance, fitted with a door that can be made absolutely air and water tight by means of india rubber accessories. The room contains three cylinders of compressed oxygen, the volume of which is 5,000 litres, sufficient to enable 30 men to breathe for three days. Inhalation gear is stored there, such as may be used for sending out reconnaisances and signaling parties. Tinned food, medicines, and first aid appliances and material are also kept in the apartment. The standard rescue room is capable of accommodating 24 men conveniently until the arrival of a rescue party within a reasonable time.

INEXPERIENCED TRUCKERS often try to stop cars by pulling back on them, instead of throwing a side pressure on them, so as to make friction between the rails and flanges. This is far more effective and much less trouble.

Notes From Cloncurry.

Cloncurry is in Queensland, Australia; it is important as a centre of copper mining that is likely to become more active when it gets a railroad outlet, in the near future. About thirty years ago a good deal of native copper was mined at Cloncurry, but now the principal ores are sulphides, with masses of oxidized material at surface. One of the most promising prospects is the Mt. Elliott mine, which has a big outcrop rich enough to be sacked for shipment on camels, as shown in the accompanying photograph. They carry it 200 miles to the railhead. It is a dry country—hot and infested with flies, so that everyone wears gauze below their hat-brim. Occasionally in the primeval forest or 'bush,' a pool survives under the shade of the big eucalyptus, as is illustrated in the second photograph. Cloncurry is one of the mining districts awaiting the conquest of modern industry. There are big outcrops and much copper ore lying loose on the surface, rich enough to warrant vigorous exploration underground. We owe these notes to Mr. Edgar Hall, of Stanthorpe.



Camels Laden With Ore From Cloncurry.

Mining in Brazil.

Foreign companies, in order to do business in Brazil and obtain authorization therefor from the Government to work in the country, must present a copy of their statutes, signed by the incorporators of the company.

There must also be presented a list of the shareholders with their names, professions, residences, and the number of shares each subscribes; a power of attorney, made out by the directors or incorporators of a company, naming a representative in Brazil with powers to represent them before the Government, law courts, or with private individuals. In this power of attorney power must be given the said representative to sign a petition requesting the Government to authorize the company to work in Brazil and all other acts necessary for the purpose.

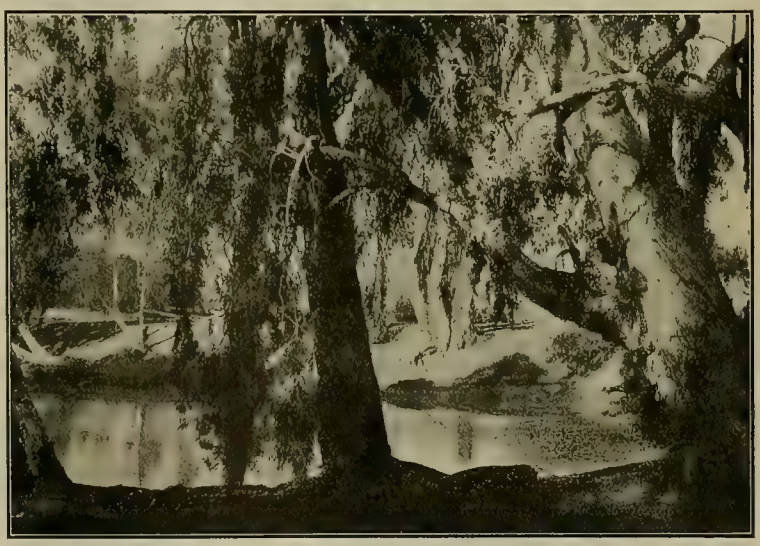
Before foreign companies, established for the purpose of working in Brazil, begin operations they must deposit in the federal treasury a tenth part of their capital; this deposit can be recovered by the company immediately after its statutes have been deposited in the archives of the Commercial Junta. For registering in the Commercial Junta, companies will pay a stamp tax of $100 Brazilian currency, which at present equals exchange about $335 American gold, for each $1,000,000 of the capital of the company, reduced to Brazilian currency at the exchange of the day the statutes are registered.

All documents must have signatures certified to at the Brazilian consulate of the place where the company was established, or if there be no consulate at that place, then (for the United States) at the consulate-general in New York City.

Expenses, besides the above-mentioned taxes, consist of translation of the documents into the Portuguese language, publication of the statutes, and the decree authorizing the company to operate and do business in the official gazette, in which governmental notices are made public, and for stamps to be placed upon the documents filed with the Government, said excise stamps being necessary to give them legality.

It may be added that concessions for mining in the several States of Brazil are granted by the several State governments, the only cost being the State taxes, which are imposed annually. With actual working concerns, acting in good faith, such imposts are not excessive, as a rule. In general, also, it may be said that there is no difficulty experienced in obtaining these concessions.

THE illustrations preserved of Egyptian iron manufacture show that the process was precisely the same as that still obtaining among Ethiopian races. On a stone, preserved at Florence, a negro slave is depicted working bellows from which the blast is conveyed by a bamboo pipe to a shallow pit in which the iron is smelted. In a second illustration is shown the forging of the iron by hammering it with a rounded stone on a stone anvil with wooden base. It is clearly proved by pictures on Egyptian tombs that bellows were in use in the 15th century B. C. This shows a distinct advance over the primitive method of smelting on a windy hillside; and it is curious to note that even at the present day furnaces with a natural air draught are used for lead-smelting in Bolivia.



In the Australian Bush.

Underground Surveying.

By Blamey Stevens.

*Some difficulty is usually experienced in accurately transferring the meridian to the bottom of a narrow shaft several hundred feet in depth. The ordinary method of transferring a meridian into a mine is to set up the transit at a station fixed at the mouth of the shaft and, after taking a back-sight on the previous station on the surface, to take a fore-sight down the shaft, the line of sight being made as much inclined to the vertical as possible. Having ascertained the intervening distance, the transit is set up at the bottom station, a back-sight taken on the top station, and the survey then carried into the galleries of the mine.

In sighting from both ends of the same highly inclined line, it will be found that errors due to the line of sight not being perpendicular to the horizontal axis are eliminated if the readings are made with the telescope in the same position at both sights, whereas errors due to inclination of the horizontal axis are eliminated if the readings are made with the telescope direct when at the top and reversed when at the bottom of the shaft, or the reverse. When it is impossible to sight up a shaft on account of its being too wet, two or more points can be set in line at the bottom of the shaft by means of the instrument when at the top, and these will determine a line of known azimuth at the bottom of the shaft.

In some cases a wire is stretched horizontally across the bottom of the shaft and as far back into the workings as possible, the wire being carefully aligned by the instrument at the top. This method may admit of even more accuracy than that of taking a back-sight to the surface from a station established on the bottom of the mine. Errors due to a slight inclination of the horizontal axis are not important when this method is used and for that reason it is also useful in cases where a sensitive striding level is not to be had. The effect of a slight inclination of the horizontal axis is simply to shift the line slightly to one side but parallel to the true position.

When no extra telescope or eccentric bearings are to be had, an ordinary transit with a prismatic eyepiece attached may be used to drop the meridian down a vertical or highly inclined shaft, provided it is not so wet as to prevent sighting upward from below. To accomplish this a thin wire is stretched horizontally across the top of the shaft at a known azimuth; the wire should be prolonged one or both ways in order to give a good base-line. Two points may be fixed at the top of the shaft if preferred. The transit is then set up on the bottom and it is brought by trial into the same vertical plane as the wire. The striding level is used in both positions and the transit is used in both the direct and reversed positions to eliminate errors.

It is to be noted that in mining and mountain work slight errors occur in sighting up steep inclines owing to the refraction of the atmosphere, but this is so slight that it does not effect the transfer of the meridian and is never taken account of.

Surveying in a mine is necessarily a process of traversing, for only the working passages are available for lines of survey. The line of traverse is not always in the centre of the passage but is often varied from it in order that the longest possible sight may be taken. In the tortuous passages of a mine it is frequently necessary to take short sights on the main traverse and since the azimuth is transferred to distant connections through these short lines great care should be exercised. The positions of the walls of the passages are noted as the work proceeds and are sketched in approximately on the plot. After the main traverses have been run, the surface boundaries, if touched, may be accurately established and the stopes and working places surveyed by more convenient and less accurate methods, from the stations already established.

It is often convenient in underground work to take the azimuth from an estimated general strike of the vein; for the direction of the meridian is of no importance in the actual working of a mine, while the direction of most of the passages will usually vary only a few degrees from the strike, and thus all traverse calculations are simplified.

A speedy and convenient manner of running an underground traverse is to use three tripods having leveling heads and centering plates like those of the transit. The transit fits on to any of these heads and while it is attached to one of them the other two are surmounted by lamp targets in which the sighting centre has exactly the same position as the sighting centre of the transit would have if set on the same tripod. These tripods are placed vertically over or under the stations and the transit is attached to the middle one. When the transit head is moved from the middle to the foremost tripod a target takes its former place and the hindmost tripod is brought ahead of the transit and set up on the new forward station. The lamp behind the plumb-target or plumb-line should give a diffused illumination of considerable area so that it may be easily found with the telescope and so that it may render the cross-hairs of the telescope plainly visible. In cases where the illumination of the object is such that the hairs cannot be distinguished, a light is thrown obliquely into the telescope tube in front of the hairs, preferably by a tube-reflector in front of the object glass.

Sometimes a brass lamp with a small central flame, called a 'plummet-lamp,' is suspended in place of a plumb-line and the flame is sighted at, but this is too small a target for quick work and the surveyor may also mistake other lights, such as miner's lamps or candles, for it when sighting through the telescope.

The station point is established either on the floor or the roof, according to the character and condition of the mine; the chief object sought is permanence of position rather than convenience in getting at the point for future use, which is of secondary importance. In a vein mine a timber in the roof, especially a stull, is often more permanent than the floor or rock roof, but any timber is likely to be moved by the miners. The hanging wall is a good place for the station, but if the inclination is small as in a coal vein, the foot-wall or floor is best.

To establish a station, get a miner to make a drill-hole about six inches deep, more or less, according to the hardness of the rock. Cut a wooden plug to fit this hole tightly when hammered in dry, and do not let any more of the plug project than is necessary. Small screw-eyes make good roof station-points from which to suspend the plumb-line, but where the lines are short a finishing nail bent to a sharp angle is better as the plumb-line will then always hang in exactly the same position. For measuring between stations a 100-ft. steel-ribbon tape, divided to hundreths of a foot is used; but for long straight tunnels and shaft work, a longer steel-wire tape is more convenient.

*From advance proofs of a chapter in a text-book on surveying prepared by George H. Hosmer and C. B. Breed, of the Massachusetts Institute of Technology, Boston.

A FACT in itself has no significance; neither have a thousand facts. What give facts their value is their relation to each other; for when enough have been collected to suggest a sequence of cause and effect, a generalization can be made which scientific men call a 'law.' The law amounts only to this, that certain phenomena have been found to succeed each other with sufficient regularity to enable us to count with reasonable certainty on their recurrence in a determined order.

The Experiences of a Tenderfoot.

By An Occasional Contributor.

Being superintendent of a mine is not such a strenuous proposition—if you have the board of directors solidly behind you. The way I came to be superintendent is scarcely worth mentioning. Several of my people, and our friends, invested in a mine in the West, and they naturally wanted to place someone in charge whom they knew and could trust. As my own people held a large block of stock, the choice fell on me as the most available among several eligibles. I had received a good education, and had already made a fair success in a mercantile way. I had the direction of a number of men clerks, office boys, and salesmen, for some time, and had handled the business admirably—so I was told. When I was asked if I would go out West and take charge of our mine, I looked upon it as an opportunity, and accepted it, particularly as I believed it would broaden my views and experience—not that I felt the need of it—but it was a change, and I thought I should like it. Mining for gold appealed to me. We were all struggling, in one way or another, to get gold, and here was a chance to actually dig it out of the ground. What ambitious young man would reject such an offer?

After several days of preparation, I left my Eastern home, carrying letters to the gentleman then in charge of the mine, to a banker, and to others in the little town where our mine was situated in Montana.

I arrived at the station where I was to leave the railroad late at night. The stage was to take me the following day to the mine, about 50 miles back in the mountains. I arose early and dressed suitably for the stage-ride, and for my entree into the mining camp. My outer apparel consisted of a blue flannel shirt, corduroy breeches, high laced boots, and a felt hat with a brim of rather liberal dimensions. I wore a sack coat, and about my waist was strapped a leathern cartridge belt with a supply of ammunition for my revolver, which I also wore—for I understood that there were some rough characters at the mines, and naturally I did not wish to be placed at a disadvantage.

The stage-ride was a delightful and novel experience. For several miles we rode across the valley through which the railroad passed, gradually ascending toward a grand range of mountains whose higher peaks were covered with snow. In these mountains, at the little town of Lynchtree, was our mine, and as we rode rapidly along the valley road, the stage-driver, who was an intelligent and entertaining fellow, endeavored to point out to me, among the numerous peaks and ridges, the particular eminence beyond which our camp was situated. I got much useful information from this driver, about the country and its people. He told me all about the mines—he had, in fact, worked in them himself. He also said it was a good thing I had my gun along, as we might be held up, which he explained meant we might be stopped and robbed by highwaymen—'road agents,' he called them. This reference to my pistol was, no doubt, intended to allay any fear I might entertain, but it really made me most uncomfortable throughout the balance of the trip, for, though I was well armed, I didn't relish being shot from ambush, which was the practice of these highwaymen, so my informant said. It was mostly, however, the down stages, he explained, that were held up, as these carried the bullion. Once we passed a man on the road, who, I thought, had a most villainous countenance, but who, the driver said, was only a charcoal burner, who lived in the vicinity, on his way to the valley for supplies. All the same, I should not have cared to meet him alone on this mountain road, when unarmed.

We had lunch at a wayside station, about noon, and after changing horses, we proceeded further into the mountain fastness. The hills had grown higher and higher as the day wore on, and the air was now becoming cool and decidedly bracing. We drove through forests of pines, maples, and aspen, and crossed rushing streams of beautifully clear icy-cold water, which the driver said were full of fish. After a time we passed over a ridge and descended a long grade, at the foot of which we came to a stream of water, running red as blood. I was astonished and expressed my surprise to the driver. "That's tailings," he said, "from the mine up here, where you are going. I don't want to be inquisitive," he continued, "but I suppose you are going up to examine the mine, ain't you?" I then told him my business—that I was the new manager, and expected to make my home in the town for an indefinite time. I didn't know whether I had offended him in some way or not, but he had very little to say after that and volunteered no further information, of which he had previously been so generous, though he did not hesitate to answer my numerous questions. He said the mine was a good one. All it required was some smart fellow who knew what he was about, and it would pay like a bank. I assured him of my intention to do the best with it that could be done. I have often wished that I had not talked quite so freely with that stage-driver, as I sometimes think he did not keep all I told him to himself, but that was several years ago.

Late in the afternoon we rounded a bend in the canyon, and there—a mile or so away—I saw a number of buildings, mainly white cottages, clinging, as it were, to the steep hill-sides; larger buildings with curious square fronts, and back of all a group of huge red buildings with white trimmings. It was certainly a picturesque and pleasing sight to an Eastern tenderfoot, for I had already learned that a stranger to the West is known by this strange appellation.

As we approached the town, the driver shook out his lines, cracked his long whip, and we dashed up the single street in a cloud of dust, attracting the attention of every person apparently, for every one in sight stopped to look at us, and as we neared the centre of the village, I noticed the greater number of citizens in the vicinity hurrying toward a common point—the post-office and stage station. I was somewhat surprised to see so many well-dressed people. White shirts and collars were abundant, and I supposed I had struck the place on a holiday, or some special occasion, but what surprised me still more was the fact that not one of the men I saw appeared to have a pistol—a 'gun', as the driver called it.

Upward of a hundred people stood about the sidewalk and in the street as we drove up, and others continued to come. The driver said he would take me up to the hotel directly, so I sat still, while the crowd eyed me curiously, and a few jocose remarks were passed between the driver and his friends in the crowd.

One fellow inquired with a grin: "See any hold-ups this trip up?" "No," said the driver, "but we're due to get one, I guess." Whether this was intended for my benefit, I did not know, but I endeavored to look unconcerned. I saw that these people were unabashed in the presence of strangers at all events.

The mail-bags and express-boxes were quickly thrown out, and we went on to the hotel. I was assigned to a small, but clean and comfortable, room. I concluded to lay aside my pistol for the time being and made some inquiries concerning those to whom I had letters of introduction. I called on the banker, and he kindly offered to accompany me to the mine. There I met the superintendent, Mr. Jones, whom we found in the office. He

wore a suit of overalls, much soiled with reddish dirt, and covered with spots and blotches of what I first thought to be dirty white paint, but which I soon learned to be candle grease.

I handed him my letter, and he said he was delighted to meet me, though he didn't look it. My coming had been announced. We sat in the office and talked a long time. He told me how things were going, and declared again his pleasure at my arrival, as he said he had for some time been wanting to visit his people in California, and that as soon as I had 'learned the ropes' he would like to go to see them. So I told him there would be no difficulty about that.

The following morning I went to the office and Mr. Jones suggested that we go underground. I expressed my willingness. He then said I had better change. I thought at first he meant my mind, but he explained that he referred to my clothes. He produced a suit of blue jeans only a little less dirty than his own, and I donned them gingerly. He then gave me a lantern, while he took a candle in a curious looking sharp-pointed contrivance he called his candlestick. We walked up toward a large red building from which came a continual roar like that of a railroad train running over a bridge. He pushed the sliding door open and stepped inside, I following. The sound was simply deafening. I looked at him, and he said something I could not understand. I shook my head, and he bawled close to my ear: "Mill." He then beckoned me to follow him and we climbed up a series of steps from floor to floor, and finally came out of the building onto a high covered trestle, along which we walked, coming out into a smaller building, where it was comparatively quiet. I noticed a huge engine, attended apparently by a man who, seated within reach of a number of levers, seemed to be doing nothing in particular. I was spared the necessity of making any inquiry by a large sign over his head which bore the legend: "Don't talk to the engineer," so I said nothing.

As I looked around, while Mr. Jones was talking with some men, a great gong suddenly rang one stroke. Immediately the man in the chair seized two levers. There was a slight hiss of steam and the huge machine began to revolve, slowly at first, then faster and faster. The engineer fixed his eyes on a great disc, where a pointer slowly moved around like a single hand on the dial of a strange clock. Suddenly he moved one of the levers, the engine slowed up somewhat, when, to my surprise, I heard a crash behind me. I looked around quickly and saw a strange looking box of iron shooting upward into a great frame of timbers. It moved more slowly and then automatically overturned, spilling its load of rock into a bin of some sort with a great roar. The box descended and quickly passed out of sight into the yawning black hole into the floor, that I had not noticed until now. As the box came down to the level of the floor I saw a sort of lattice work of steel that had been above it, caught on the floor in some manner and remained there while the box—I tried to think of the name of it, and remembered that this must be the 'skip.' As the skip passed down the shaft, clouds of ill-smelling steam poured out of the shaft through the bars of the lattice work, which I now understood was intended to prevent careless persons from falling into the hole.

"Well," said Mr. Jones, "If you like, we'll go below on the next skip." Then turning to a man standing near, said: "This is Mr. Ham, the foreman." Mr. Ham wiped his hand on his breeches and extended it. I took it and he shook mine heartily. When he let go I noticed that my hand now bore some of the stains of his toil.

The gong clanged again. I counted one, two, three; then, after a pause, one. Again the engine hissed and the drum commenced to revolve. This time it moved more slowly, and it took some time to bring the skip to the surface. When it finally appeared, there were two men on it. Both wore yellow coats, anything but clean, and dripping with water. Mr. Jones assisted me in putting on a yellow oil coat, but I was pleased to notice that it was quite new. A hat, of similar material, and in shape like those worn by firemen, was provided and we stepped onto a platform of boards placed across what I correctly guessed to be a skip. Mr. Jones grasped a wire cord, and rang a gong 5—3—2. Almost instantly we began to sink downward. I caught a bar of iron over my head, as directed by Mr. Jones, and we went down, down, down, as it seemed to me, almost to Hades. Twice I noticed the flash of lights in what seemed to be a room way down underground. I thought of many things during that brief trip of less than a minute, but my chief thought was, what would happen should the rope, that held us suspended in the black, cold hole, break. I held a cigar between my teeth, and was surprised when the skip finally stopped opposite a well-lighted room, to find I had bitten it in two. I said nothing, but threw it away.

On that, my first visit underground, I saw many strange things, things which since have become very familiar, but at that time it would have required little to have persuaded me to return to my Eastern home; but in time I grew to like it. The rapid flight up or down through the shaft, which no longer had any terrors for me, the daily trip through the drifts, the climb up into stopes, the fearful racket of the machine-drills, the study of the vagaries of the vein; the handling of the men; the mill with its deafening roar. All became dear to my soul and to be where I could not see or hear the sound of the mines was to be dissatisfied and unhappy.

VANCOUVER ISLAND.—The principal product of Vancouver Island is coal, of which there were mined during 1905, 993,899 tons. Of this amount 380,332 tons were sold in Canada, 427,698 tons exported to the United States, and the remainder used for local consumption. The amount of coke produced was 15,661 tons, of which 5,410 tons were sold in Canada and 4,300 in the United States, including Alaska, while 5,950 tons were added to stock. In 1904 the mines turned out 1,023,013 tons of coal and 19,371 tons of coke. The total coal sales show an increase of 24,000 tons, or 3% over 1904. The sales to the United States amounted to 53% of the total, most of which was disposed of in the California market, the remainder going to Alaska, where the recent developments in metalliferous mining seem destined to produce a constantly increasing market for this article.

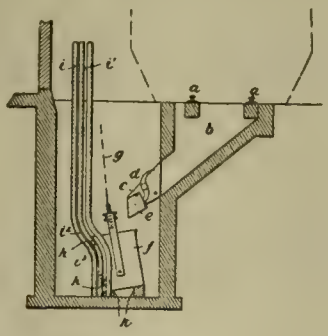
Of the two smelters the one at Crofton was not in operation during 1905, but blew in on January 6, 1906, and is treating ore from the Britannia and other coast mines. The Tye smelter at Ladysmith was in blast 164 days of 24 hours each, and produced 38,960 tons of smelted ore. The value of the ore smelted, less refining charges, was $506,600. The copper product of the island in 1905 was 3,437,236 lb., a decrease of 2,523,357 lb. from 1904.

MEASURING FLOW OF AN ARTESIAN WELL.—Under conditions where a weir could not be built, a novel way of measuring the flow of an artesian well was devised. Forty feet of 10-inch pipe was screwed into a 90° elbow on the pipe where it came out of the ground, and a hand force-pump attached to a small hole tapped into this pipe. The force-pump drew a red aniline liquid from a pail and injected it into the stream, where it was carried along with the water and at the same rate. By means of a stop-watch and the known carrying capacity of the pipe the flow of the well was easily determined.—*Iron Age.*

MINING AND METALLURGICAL PATENTS.

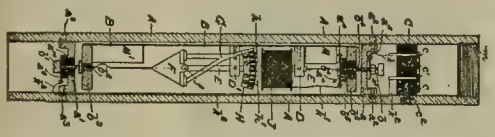
Specially reported for the MINING AND SCIENTIFIC PRESS.

ORE-HOIST.—No. 830,836; Charles W. Hunt, West New Brighton, N. Y.



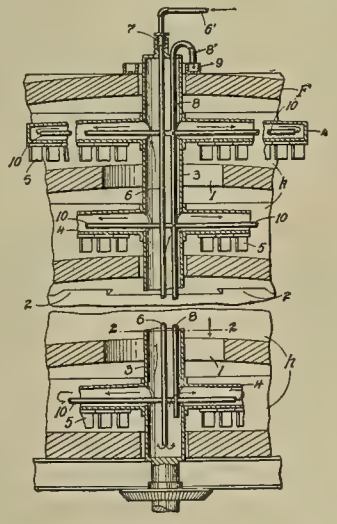
In an apparatus of the character described the combination with a chute and a vertically movable skip of guides for said skip standing at a distance from the end of the chute to permit the skip to clear the same in its movement and carried inward toward the vertical plane of the chute below the same to guide the skip below the end of the chute.

MEANS FOR SURVEYING BORE-HOLES.—No. 830,730; Hugh F. Marriott, Parktown, Transvaal.



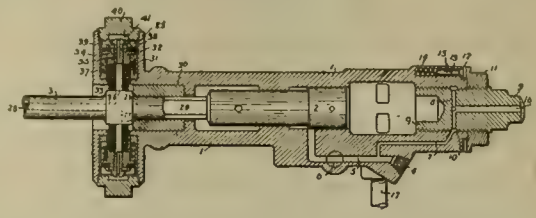
An instrument for surveying bore-holes comprising a casing, a revoluble portion pivoted on its longitudinal axis in said casing, a plumb-bob pivotally carried by said revoluble portion, the pivot thereof being at right angles to the longitudinal axis of said portion, a switch arm carried by said plumb-bob, a commutator carried by said revoluble portion over which the switch-arm is caused to travel as the revoluble portion is inclined, said revoluble portion being so weighted that it moves into a position to cause said switch-arm to move in a vertical plane, and means for transmitting the indications of the movements of the switch-arm over the commutator, substantially as described.

ROASTING-FURNACE.—No. 831,166; Frank Klepetko, New York, N. Y.



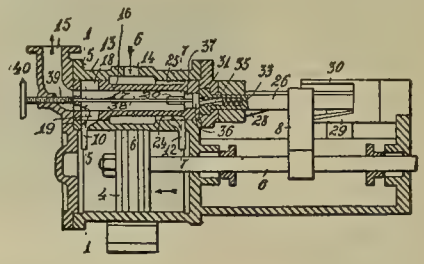
In a furnace having a plurality of hearths, a hollow shaft passing through the hearths, a series of hollow arms radiating from said shaft and extending into the several hearths, a feed-pipe passing longitudinally through and discharging into the shaft, an outlet-pipe located within the shaft, and a series of branches leading to said outlet-pipe and communicating with the interior of the hollow arms for conducting the circulating medium from the arms into the outlet-pipe, substantially as set forth.

ROCK-DRILL.—No. 830,744; Charles H. Shaw, Denver, Colorado. Filed September 21, 1905.



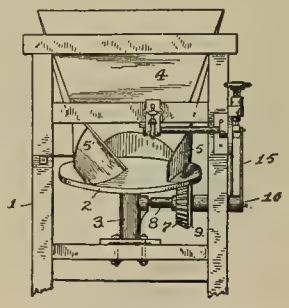
In a drill mechanism, a casing, a hollow drill-shank inserted in the casing and provided with a lateral opening, a cylinder formed within the casing adjacent the shank, a hollow piston mounted to reciprocate within the cylinder, an elastic packing carried by the piston and in contact with the shank, a duct forming communication between the casing and the cylinder and opening in the rear of the piston, and means to admit fluid under pressure to the casing.

DUPLEX STEAM-PUMP.—No. 830,723; Johan Kofoed, Christiania, Norway.



In combination with the steam-cylinders, pistons and piston-rods of a duplex steam-pump, of a valve-chamber common to said steam-cylinders and connected therewith by steam-passages, a valve revolubly arranged within said chamber and provided with steam-passages and having its stem projecting beyond the said chamber, cams on said stem and means on the piston-rods adapted to alternately engage said cams on said stem so as to impart an intermittent rotary movement to the valve in one and the same direction, thereby alternately admitting and exhausting steam to and from the said steam-cylinders respectively.

ORE-FEEDER.—No. 831,595: Forest H. Blanding, San Francisco, California.



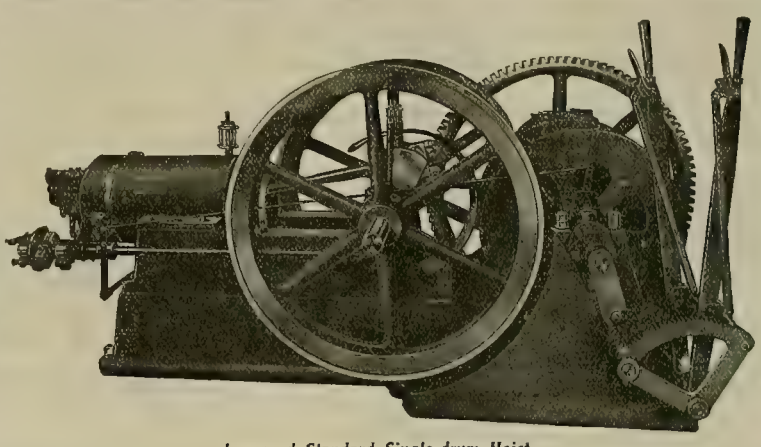
In an ore-feeder, the combination of a rotatable feed-table, of a rock-shaft, of a gear loose on said shaft engaging the feed-table, of means secured to the said shaft for frictionally engaging with the gear to actuate the same with the movement of the rock-shaft, and cam-actuated devices for imparting motion to the said rock-shaft.

A Gasoline Mine-Hoist.

The improvements in mining hoists have been rapid, and in the last few years they have reached unexpected proportions. Of the different modes of power used in the average metal mine there is practically no comparison with the gasoline, distillate, or alcohol hoist. The last mentioned fuel has yet not played so important a part in the mines of this country, but is being used extensively in South America.

The advantages of a gas-operating hoist are many. It requires but litte water, that being used for the cooling of the engine cylinder. The fuel is needed in such small quantities that it can be carried to any point and to those mines that are difficult to reach. There is no consumption of material outside of the small amount of fuel that is used, and it enables plants to keep in operation that would otherwise be compelled to shut down in some seasons, owing to climatic conditions that make the mine inaccessible.

We illustrate here the improved standard single-drum Witte hoist manufactured exclusively by the Witte Iron Works Co., of Kansas City, Mo. This hoist operates on either gasoline, distillate, or alcohol, and while it is well known, and is being used extensively in all mining regions of the United States and other countries, the attention of our readers is called to a few points mentioned in the catalogue issued by the manufacturers. The engine-bed is built separate from the hoist-bed, thus decreasing the weight by dividing the shipment for transportation and, where necessary, it can be used as an independent power separate from the hoist. The engine-shaft is extended so that an additional pulley can be added for operating a compressor. The levers, instead of facing the drum, either face the engine or rope; they are reversible and are mounted on the hoist-bed proper, so an independent base is not needed. The thrust-screw is operated by a long lever giving powerful leverage and a great factor of safety over the old short hand-lever. The speeder-lever, the friction- and the brake-lever are all in convenient reach of the operator, who may at the same time attend to the ropes and buckets. The action of the friction and brake is positive. They can be locked at any point or thrown in at a moment's notice and, by means of the speeder, attain double the usual speed, an advantage particularly desired in prospecting equipments. The engine is equipped with wipe-feed oil system, so that the operator can at a glance see that every bearing on the engine is being lubricated. These hoists are manufactured in many sizes, with speeds arranged in proportion to load, the ratios being changed to suit the requirements of customers. One particular feature set forth in the catalogue is the absolute guarantee of safety in the operation of the hoist, its efficiency, and economy in fuel, and that all defective parts will be replaced for a period of five years. It is also noted that this hoist is not overweighted or top heavy, being built in a permanent manner, applying the weight where it is most needed without making it cumbersome.



Improved Standard Single-drum Hoist.

Publications Received.

THE ABENDROTH & ROOT MFG. CO., of Newburgh, New York, has issued an attractive hand-book on Root Spiral Riveted Pipe and Root Water-Tube Boilers manufactured for mining purposes. The book contains many valuable data on hydraulics and a useful price list.

Commercial Paragraphs.

THE LOMBARD-REPLOGLE ENGINEERING CO. has issued a bulletin describing its water-wheel governors. This is an important feature of any hydraulic installation.

THE AMERICAN SAFETY POWDER CO., of San Jose, reports the receipt through its contracting agent of a gratifying number of orders and inquiries for Aspco.

THE MAYER FACTORY of Milwaukee uses annually 415,612 hides of steers, cows, calves, goats, horses, sheep, and kangaroos. In the ordinary whirl of business people do not realize the enormous industry represented by a large boot and shoe company.

THE SAMSON MFG. CO., 1734 Fifteenth St., Denver, Colo., has been in business the past two years, and the sales of crushers have been 59 and the inquiries for these machines are increasing daily. This company is now putting on the market a smaller sized machine, which promises to be popular.

THE MARION STEAM SHOVEL CO., of Marion, Ohio, reports the receipt of one order for twenty-three Model No. 91 and six Model No. 60 shovels to be used in the Mesaba iron range of Minnesota. This order is particularly gratifying, as it was obtained in the face of strong competition and also for a district in which the merits of various machines have been thoroughly tried.

THE Daly-Judge Mining Co., of Park City, Utah, has let a contract for furnishing a 12 by 24 in. Reynolds Reliance Corliss engine of the belted type to the Allis-Chalmers Co., of Milwaukee. The new unit will operate at a speed of 130 r.p.m., non-condensing, under a steam pressure of 110 lb., and will be belted to a countershaft running concentrating tables and an electric generator.

THE PACIFIC HIGH EXPLOSIVE CO., a New York corporation, has purchased 50 acres of water-front land near Oakland, Cal., on which it is erecting buildings for the manufacture of Trojan Non-Freezing Powder, regarding which the following statement is made: "This is a new explosive having all the strength of nitro-glycerine dynamite, but without being effected by heat or cold. Tests have been made, by placing this powder in ice for 48 hours, and when shot, its disruptive power had not diminished in the slightest degree."

Books Received.

A novelty in books is found in the TECHNICAL DICTIONARY, printed in six languages—English, German, French, Russian, Italian, and Spanish. In addition to the names of mechanical and scientific objects, the work is illustrated. Its use is restricted to machines and tools, but suggests the possibilities of other compilations in the same direction. The book is an innovation and decidedly interesting. Sent by the MINING AND SCIENTIFIC PRESS upon receipt of price $2 net. McGraw Publishing Co., New York City.

STRAY CURRENTS FROM ELECTRIC RAILWAYS is the title of a new work by Dr. Carl Michalke. All are interested in the strange and remarkable effects of electrolysis caused by currents escaping from electric railway wires and tracks. Mysterious electric currents are found in so many places that they are a source of constant interest and often of annoyance. This little book deals with these fugitive currents and their effects. Sent by the MINING AND SCIENTIFIC PRESS on receipt of price $1.50 net. McGraw Publishing Co., New York City.

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Editorial.

THE EXTRAORDINARY PROSPERITY and expanding industrial activity of the United States is evinced in the continued and increasing shortage of railroad cars, the supply of which is quite inadequate to the moving of the freight that is awaiting transport. In some departments of business this condition threatens a blockade of the material required for manufacture. Both the basic industries, that of grain and that of iron ore, are handicapped in this way. Another sign of the times is the strain on the money market; New York has tried to raid London for gold, and London is scouring the rest of the world for the medium of exchange.

NEVADA now holds third place in the production of gold, being second only to Colorado and California. At the present time one mine at Goldfield is producing $1,000,000 worth of ore per month. And there are so many new districts in course of development that the future is full of promise.

OUR DISCUSSION DEPARTMENT gains dignity this week from the letter of Mr. D'Arcy Weatherbe, in the course of which he gives much valuable information on dredging for gold. Mr. J. H. Curle wrote an informing and also questioning letter in our issue of January 27; he now gets a full and trustworthy reply to his queries, together with some fair criticism of his own opinions. These two contributions, together with that of Mr. C. W. Purington, give as much real information as the several books on the subject compiled by amateurs during recent years.

THE ANNUAL STATISTICS of the State Mining Bureau are published on another page. They exhibit several interesting features; the continued prominence of gold mining, the importance of the oil industry, and the growth of copper mining. In the last of these there was not the gain that was expected, and that has taken place during the current year. The copper mines of Shasta county are destined to play an important part in the industrial advancement of California. Nevada county is still first in gold production, thanks to two or three old reliable mines, such as the North Star and the Empire. One portion of the mineral product has become of much enhanced importance, namely, the structural materials. It seems thriftless for California to import cement from Germany when she possesses rock suitable for the purpose, and it is wasteful to destroy our forests when good clay is available for making brick. These departments of industry ought to be strongly stimulated by the necessities of San Francisco and her neighboring cities on the Bay.

THE COMPLETION of the railroad from Cobre to Ely, constituting the Nevada Northern Railway, was befittingly celebrated recently. On that occasion Mr. Mark

L. Requa delivered an address, an abstract of which we give elsewhere, for it contained many suggestive statements. He knew there was a big copper deposit at Ely, but a deposit is not a mine; it was low-grade material, which could only be made pay-ore by the erection of expensive reduction works and the construction of a railroad. Neither was justified unless an adequate tonnage of a certain copper content was available. It was a question of systematic sampling; first, by hand; then, in larger lots in an experimental mill. While these tests were in progress, vigorous exploration laid open increased reserves of ore. It was good mining and sound business. If Mr. Requa and his professional associates, Messrs. F. W. Bradley and J. H. Mackenzie, have made a fortune apiece, they have deserved it. It was the logical result of skill applied to circumstance.

The Smelting Monopoly.

At the recent Mining Congress an effort was made to ventilate the grievances of mine owners in regard to excessive—so it is claimed—rates for treatment levied by the smelter trust, namely, the American Smelting & Refining Company. In order to prevent a one-sided and therefore useless presentation of the subject, it was arranged that the local manager of the smelter people should be present and reply to the arraignment of his employer. The attack was prepared by Mr. E. M. De la Vergne, a State Senator and a representative mine operator of Cripple Creek, while the defence—which was anything but meek—was made by Mr. Franklin Guiterman, a technical man of the highest standing in the profession. The effort to secure a fair discussion of a complicated matter was a failure. On the one side there was too little judgment in the criticism offered; on the other, there was the confident assertiveness of a man who knew his own business and thought it best for others to attend to theirs. It was not the best audience for such a debate; the mine operators in Colorado are naturally irritated because they have only one market for their ores where formerly they could get four or five bids on every carload. Even if the ore buyer be a saintly personage, one naturally dislikes to be compelled to deal with him only; it is so much pleasanter to have a little choice in the matter and to be able to ship the ore to different people, as circumstances direct. Furthermore, Mr. Simon Guggenheim is a candidate for the senatorship; he has had a political bee in his bonnet for some time—ever since he was nominated for lieutenant governor about eight years ago. Naturally, he has incurred the bitter opposition of the group of politicians who have kept Colorado in a condition of turmoil for the last decade; in consequence, he and the smelting company are being viciously attacked in the Denver papers. And, frankly, we think that the average citizen of Colorado has a right to object to the senatorship going to a man whose chief qualification is his wealth; it may be that his wealth was not won at the expense of the State, but that it is the result of an honorable business activity which has enriched both the smelterman and the community, nevertheless it is about time that senatorships were no longer put up to auction. These considerations and others into which it is needless to go, made it impossible for the convention at Denver to offer a fair hearing to any discussion on the rates of treatment. It was a pity; for an open debate might have killed many of the fallacies rampant on this question and it would have given the smelting company an opportunity to speak to the public squarely and thus remove some of the prejudice created by irresponsible politicians. As we view the matter, there are three features that stand out prominently. In the first place, much of the talk on sampling and ore settlements overlooks the fact that the whole technical process of assaying and sampling is based on the doctrine of averages. Mine managers are apt to ask for a settlement on the highest assay and to demand a re-sampling when the smelter assay is lower than theirs. It is hard for a seller of ore to believe that the highest assay does not represent the most accurate result. On the other side, the smelter manager often insists on hand sampling or other methods that introduce the personal equation and subvert the doctrine of averages. No one ignorant of the technique of sampling and assaying is in a position to discuss this subject. It is one that should be under the control of inspectors or other persons—if such were obtainable—who could make it their business to detect chicanery on either side. Next comes the question of competition. The mine operators are largely to blame for the absence of it. If an independent smelter starts to work—for example, at Golden or Salida—they give it a warm welcome and send their ore to the new market, which gives them cheaper treatment. Then, in the ordinary course of human events, the American Smelting & Refining Company lowers its rates so as to take the business from its competitor. Promptly, the mine operators desert the opposition. Their guide is self-interest; so is the smelting company's. The public welfare or the prosperity of the State or the development of a mining district are all made subservient to the exigencies of business. Sentiment is conspicuously absent. Finally, there is another aspect of this question. The strong position of the smelter combination is based, not on its huge capital, its ore contracts, its many reduction works, but on a monopoly of talent; take away the highly skilled and widely experienced metallurgical specialists and constructing engineers that are now the active force in its manifold operations and it would become merely a big stock company, controlled by a number of clever capitalists. We do not under-rate the ability and integrity of the particular family identified with the smelting combination; but they are not technical men, they are shrewd financiers. It may seem that their strength is in their money, but money is plentiful nowadays; they owe their dominating position to the corps of technical experts whom they have retained. Other metallurgists are being trained elsewhere—there are enough independent smelters for that purpose; and if the big corporation should develop a tyrannical spirit or become in fact what it is now loosely termed—a trust, a monopoly contrary to public good, calculated to cripple the development of the mining industry—then it would lose the mainstay of its strength. First-class technical ability is rarer than money. The matter will regulate itself.

By the Way.

THE INCORPORATION OF TRADE UNIONS.—The Massachusetts Bureau of Statistics of Labor sent a number of questions to four classes of persons—employers, labor leaders, lawyers, and 'the public.' The last-named class was made up largely of college presidents, professors, and editors. Of 963 letters sent out, replies were received from 301, this number being made up of 96 employers, 81 labor leaders, 71 'public,' and 53 lawyers. The report gives the summation of the results of the inquiry:

Employers believe that trade unions should incorporate because the better class of members would be individually active in the management of the union for the purpose of conservative action leading to continually increased strength in their standing before the community.

Labor leaders, on the other hand, believe that trade unions should not be incorporated because the individual member would be held responsible for the actions of the organizations, also because the organizations would be held responsible for the action of the individual member, or, in other words, the responsible members would be liable on account of the irresponsible ones. They are further opposed to incorporation for the reasons as they advance, that their funds would be liable to attachment, and that manufacturers would possess more power in the courts than the unions because they could employ the best available legal talent to advance their claims.

The public view is that incorporation is desirable both from the standpoint of the public and unions, for, while it might limit to a certain degree the freedom of action of the unions in ways which do not now exist, and at times the unions might be embarrassed by legal proceedings directed against them, these disadvantages would be more than offset by the greater willingness of their employers to deal with the unions when they feel that the unions are legally responsible bodies. In view of certain decisions of the courts it is thought that the responsibility desired may already exist, but there would be no doubt about it if the unions were incorporated.

The legal profession, which is perhaps in a better position to judge impartially of the matter than any other, for the reason that it may have as clients both employers and employees, is of the opinion that it would not be inimical to the interests of trade unions to be incorporated. The legal profession declares the difficulty with trade unions at present to be their irresponsible character. It is claimed that they frequently fail to show any regard whatever for their agreements, which is the first essential in commanding public respect. Incorporation would mean responsibility, and actions by responsible unions would be accepted as a pledge of good faith by responsible employers.

THE UNION LABEL.—The following is taken from *The American Lumberman*, and formed part of a letter from its Seattle correspondent:

When J. S. Bennett, of the Jay S. Bennett Lumber Company, returned from the East last week he brought with him a shingle bearing the union label. The securing of the shingle furnishes an object lesson to millmen as to what would be the result of unionizing the mills and placing control of all plants in the hand of the union. Exhibiting the shingle, Mr. Bennett said:

"This shingle, which is what is known as a bastard of the worst kind, was the wrapper on one bundle of a shipment sent out by us to Newark, Ohio, March 29. As you see, it has the union brand I. S. W. U. stamped on it. It came from one of our contract mills, which had signed the contract to allow the union to operate the mill and brand all shingles with its label. I happened to be in Newark and saw a man putting this shingle on a house. I inquired regarding it and found it was from our shipment. I also found that the same shipment contained many of the same kind, which are wholly worthless. I promptly made a reduction on the car, on account of the quality of these unionized shingles. This shingle, and most of the others found, is a featherweight. It is a regular clear shingle, but in every way a bastard. It should never have passed the knot sawyer, and if it did, the packer should have thrown it away. Under the open shop plan, where the manufacturer controls the manufacture of his product, this or any other shingles would not have gone out.

Immediately on my return home I canceled my contract with this union mill. I find I am having trouble with every shipment of union label branded shingles I made from this contract mill."

Commenting on the foregoing, *The Industrial World* says:

The union label does not represent skill, superior workmanship, or merit in any degree in any trade or business wherein it is used, but is simply a badge of discrimination and a weapon of organized labor with which they seek to force employers, employees, and the public to bow to their arbitrary rule and monopolistic dictation.

The American nation was founded on fair play and a square deal to everyone who became its citizen, and a device that is used as a symbol of monopoly or as a weapon to aid in creating a monopoly should not be sanctioned by the public for a single moment.

It does not matter where arbitrary monopoly appears, whether in capital or labor, the principle is essentially un-American and vicious; nor does it cut the slightest figure as to the methods that may be adopted to create and maintain such a monopoly, wherever they appear, or under whatever guise they may assume, the public should crush them without hesitation or remorse.

The union label is a form of general boycott, intended to proscribe those who do not use it. It is the most dangerous of all the weapons that the labor trust has invented.

THE GUGGENHEIMS IN POETRY.—There was a time when the Rothschilds represented the big purchasing element in mining business; then came Whitaker Wright, Hooley, and other promoters, including first-class financial houses like the Exploration Co. But other times, other people. Just now Schwab and the Guggenheims—the latter preferred—are filling the imagination of the prospective seller of mines. These remarks will introduce the following verses that come to us from Alaska:

If you've got a claim on Swede creek, or Montana or Moosehide,
Which to plant on some poor sucker for many years you've tried,
Don't rush away to Europe, or other foreign climes—
Just stay right here in Dawson and approach the Guggenheims.

If you've got the hard rock fever and have staked upon the Dome,
Or own a claim upon the lead that runs from here to Nome,
Don't let 'em lapse, whate'er you do, but hustle round betimes,
And unload your proposition on the wealthy Guggenheims.

Perhaps of all the placers you have got the very cream,
Or a dredging proposition, or some other wild-cat scheme—
Don't take too many chances in these fluctuating times,
But get a sudden move on, and see the Guggenheims.

Whether the gentlemen who congregate at 71 Broadway, New York, are easy, we do not know. We suspected otherwise. But why disillusion the enthusiast at Dawson?

THE interests of science and of industry are identical; science cannot make a step forward without, sooner or later, opening up new channels for industry; and, on the other hand, every advance of industry facilitates these experimental investigations, upon which the growth of science depends.

Special Correspondence.

London.

Another Cornish Flotation.—Mining Costs on the Rand as Compared to Cornwall.—Death of Richard Tangye.—Discoveries in the Mysore.—West Australian Dividends.—Concentration at Broken Hill.—The Deep Leads in Victoria.—Mining in Sumatra.—Returns From Mexican Mines.

The latest event in Cornish mining is the formation of Wheal Kitty & Penhalls United, Ltd. The capital is £35,000 in shares of 10s. each, of which £1,000 goes to the vendor company in cash, with £12,000 in fully paid shares, that company giving a guarantee for the subscription of £10,000 toward the working capital. The directors are Messrs. J. H. Collins, Arthur Pearce Jenkin, and John Vivian. The property, which is in the St. Agnes district, comprises Wheal Kitty, about 200 acres in extent, traversed, it is said, by at least five known lodes, and Penhalls, which adjoins, nearly as large. The prospectus states that the directors are advised that the lodes may be opened out so as to make large and profitable returns. Both mines have been worked at intervals for a long time, but no records are available as to the early workings. Since 1853, Wheal Kitty has returned 8,393 tons of black tin ore for £508,683, working on a small scale with old-fashioned machinery. Penhalls, from 1860 to 1884, yielded 3,592 tons of tin ore for £212,083. The new capital will be employed to deepen and equip the main shaft, and to open out the various lodes for an increased output, and to provide machinery as may be required, including rock-drilling plant. Another property is being taken in hand by Mr. J. H. Collins for future flotation as a limited company; it is the Tregrahan mine in the St. Austell district, where also the Wheal Eliza group is attracting attention for operation on the same lines in the near future.

A comparison made by a Cornish press correspondent shows that, while working costs on the Rand during a recent period reached 22s. 3d. per ton of ore-stuff milled, at least one Cornish mine was working at a cost of 13s. 8d. per ton of ore-stuff milled and magnetically treated. Even Dolcoath, working over half a mile vertical from surface, and after paying lords' dues and all development, was able to keep its working costs during the first half of this year to £1 1s. 10d. per ton. Cornish lode-values are, roughly speaking, 2% black tin, or, say £2 per ton of ore-stuff raised, plus copper, arsenic, wolfram, and other by-products.

A notable Cornishman, bearing a name familiar to mining men the world over, has just passed away. From the numerous obituary notices it may be gathered that from the humblest origin, Sir Richard Tangye worked his way to a position of great affluence and of high standing in the world of engineering. His brothers were partners in the wonderful growth of the enterprise, from a back shop and one 'hand' to a block of buildings covering 20 acres, and giving employment to some 2,500 workmen, but it must be laid to the credit of Sir Richard that he it was who saw the possibilities for their mechanical and engineering skill in Birmingham and induced his brothers to throw in their lot with him. The story is re-told, of how Brunel, the famous engineer, being in need of some powerful appliances to aid in launching the Great Eastern, went to the small Birmingham workshop. The result was that Tangye Brothers supplied the hydraulic lifting-jacks of their own invention, which set the vessel afloat, and enabled Sir Richard in later days to declare: "We launched the Great Eastern and the Great Eastern launched us."

Discoveries of considerable importance are reported in the three bottom levels of the Mysore mine at depths of 2,060, 1,960, and 1,860 ft. driven south from McTaggart's shaft. At these points the lode varies from 1½ to 2½ ft., with assays of 12 dwt., 1 oz. 2 dwt., and 2 oz. 18 dwt. per ton. It is considered to be too early yet to form conclusions as to the dimensions of the new shoot, but on September 6 they had already driven 40 ft. in reef worth over 2 oz. per ton at the deepest point—the 2,060-ft. level. These discoveries in the southernmost part of the mine are said to clearly demonstrate the fact that the lode in going south is repeatedly being folded to the west.

The West Australian dividends declared during the past quarter are once again over half a million sterling, amounting to £504,161, which compares with £548,575 for the second quarter of the year, and £419,000 for the first quarter. The Oroya-Brownhill heads the list for the past quarter with £90,000, Golden Horseshoe being second with £75,000, and Great Boulder third with £65,625, while Great Fingall, with £62,500, is not far behind.

Regarding the Broken Hill district, information is to hand from the Zinc Corporation as to the results of the investigation work in the treatment of the company's tailing by Mr. A. L. Queneau and staff. A long series of experiments have been made, and the final test-run of 1,300 tons of tailing showed a recovery of 81% zinc, 55% lead, and 55% silver. There were 348 tons of concentrates produced from the 1,300 tons of tailing, having a value of 44% zinc, 8% lead, and 8 oz. silver. A parcel of these concentrates was further treated, and it has been demonstrated that the concentrates could be separated into a lead concentrate and a zinc concentrate, the former having a value of about 45% lead, 10% zinc, and 20 oz. silver per ton, the leady concentrate embracing about 12% of the whole, and it can be still further treated to improve the lead content. The zinky concentrate, containing 88% of the entire concentrates, has an average value of 50% zinc, 4½% lead, and 8 oz. silver per ton. The directors are advised that the management considers it possible to improve these results when the plant has been fully organized, and Mr. Queneau states that he can guarantee an extraction of 85% zinc, 60% lead, and 60% silver. These results are deemed highly satisfactory and show that systematic working will be very profitable. The No. 2 plant on the British Broken Hill Proprietary mine is now in process of alteration and expansion, in order to provide sufficient capacity to treat the whole of the current output of that mine. This plant is expected to be in full operation by December 1. The large No. 1 plant, which is being constructed to treat the tailing from the Block 14, South, and Block 10 mines, is making satisfactory progress.

Cabled advices received from the general managers of Loddon Valley Goldfields state that they have successfully extended the main escape drift at the 410-ft. level into the gravel beds lying above the wash. This drift is 44 ft. above the main drift, and the gravels which have been entered are therefore 15 to 20 ft. above the wash. This indicates that the water has now been drained to below this level, and that there will be no difficulty in entering the wash itself from the main workings as soon as the precautionary work required by the Government has been completed. This work will require some weeks to carry out. The point entered is on the western side of the ancient valley, and is some 300 to 500 ft. from the auriferous channel.

Interest in Mexican mines continues to be fairly well maintained on the market. According to the September return from El Oro, No. 1 mill ran 27 days; the No. 2 mill ran 28 days, and together crushed 20,277 tons of ore, producing $184,710; less working expenses $90,306,

development expenses $8,879, leaving $85,525, profit from the railway $5,443; total $90,968 U. S. The sum of $475 was expended during the month on permanent improvements. The Dolores return for August is only just to hand. The profit for the month is $10,764 from 1,111 tons treated, the total receipts being $33,784. The report states that indications are that from $15,000 to $20,000 additional profit is at present locked up in the cyanide plant which will be released in the final clean-up. Owing to a break on the line-shaft driving the battery, the August output was materially curtailed. Late telegrams show that the mill is again in regular operation. Rumors which have been rife concerning Dolores have received confirmation from a circular issued this week by the English company. The directors inform the shareholders that they have received from the board of Dolores Mines Co. a copy of Mr. John B. Farish's report on his visit to the mine in June and July last. The directors of the American company advise that their agreement with Messrs. Farish and McCarty has been terminated, and that they have appointed Mr. George A. Schroter as consulting engineer. They also state that, in view of the fact that considerable expenditure for additional equipment, buildings, additions to the mill, etc., will shortly be necessary at the mine, and in view of the desirability of providing for the existing indebtedness and for an ample working capital, they are of the opinion that the stock of the American company should be increased from 330,000 shares of $5 each, to 400,000 shares of $5 each. The additional new shares are to be offered at par to the English company, and this arrangement necessitates a corresponding increase of 70,000 shares in the capital of the English company; 66,000 of such new shares will be offered to the members of this company at $5 per share, and it is intended to leave the remaining 4,000 shares unissued at present.

Melbourne, Australia.

Coal Miners Strike.—The Dog Watch.—Labor Unrest at Broken Hill.—Gold Stealing in Western Australia.—Evidence Before the Royal Commission.—Serious Allegations.

The air is full of talk about strikes. The first of these in importance is the one threatened in the Newcastle coalfield. To understand the dispute one has to go back a little. There has been a simmering of discontent in the district for a very long time. The last general strike took place on the broad question of an increase in the hewing rate. By an old agreement the owners consented to advance 4d. per ton on the hewing rate for each shilling per ton advance in the selling price of coal with a then minimum rate of 2s. 10d. per ton. A strike occurred on the question whether the rate should be jumped to 3s. 6d. per ton and the men after being out of work for two months capitulated on a hewing rate of 2s. 11d. as against 3s., which had been previously paid to them. Since then there has been an Arbitration Act to prevent strikes, but the miners have in this instance ignored that statute and taken the law into their own hands. What they ask for is the abolition of the night or 'dog watch' shift. The agitators are in the Maitland district, but their cause has been endorsed by the Newcastle miners with whose Union the Maitland miners' lodge is affiliated. The miners' claim is that the climate is so trying that they cannot sleep in the daytime after the 'dog watch,' and that there is no real need for the third shift, from 12 P. M. to 8 A. M. They point out further that the cessation of work for the shift will ensure the better ventilation of the working places, thus making them healthier and permitting of a greater output during the working time. Then there is a proposal that the hewing rate shall be raised 8d. per ton. At present the selling price of coal is 8s. per ton, but the hewing rate is on the basis of a selling price of 9s. per ton; therefore, to increase the hewing rate 8d. per ton means raising the selling price to 11s. per ton. The owners offer to abolish the 'dog watch' from the end of the year except in the case of two pits at Maitland, and to raise the selling rate to 10s., thus guaranteeing an increase of 4d. per ton in the hewing rate. The real fight, however, is over the 'dog watch,' and it is not clear at the moment of writing whether a strike is to take place or not. The output of the Newcastle collieries is about 4,000,000 tons per annum and any disruption of the trade means a serious loss to every industry in the commonwealth. No wonder, therefore, that the strike is in everyone's mouth. The owners are fighting bravely and they have the public sympathy, without which no labor movement can succeed.

Another small cloud is the threat of a demand for higher wages from the silver-lead miners of the Barrier. These some time back applied to the Arbitration Court for an increase, but were denied any advance. That was asked mainly because lead was then worth only between £11 and £12 per ton, and the Broken Hill Proprietary Co. was only making 3s. 3d. profit per ton of crude. Last half year, however, saw that profit raised to over 20s. per ton, owing to the average price obtained for lead during the term being nearly £15. Now lead is up to £18 10s., and the company is obtaining a large additional revenue from its zinc residues. All the other companies show equally improved balance sheets. The mining population has in no sense shared in the more prosperous state of the industry. It must be confessed that there is a good deal of sympathy with them. At the present time the average earnings of miners are about 11s. per shift of eight hours. Living is expensive at Broken Hill and the climate very trying, especially in the summer time. The whole subject at present rests in the hands of the Proprietary employees who have held meetings to discuss the subject, but have postponed any decision for a fortnight. Should a coal strike come, the miners may be thrown idle, and then the movement may fizzle out, especially if the period of enforced idleness extends over a lengthened period.

Some remarkable evidence has been given in Western Australia before a Royal Commission appointed to inquire into the gold stealing evil. The investigation was the outcome of an interview with Mr. J. E. Scantlebury, a London journalist, who asserted that he had been told by a reliable State official that gold to the value of £1,000,000 was stolen annually from the Kalgoorlie mines. This statement, though obviously an exaggeration, was still sufficiently damaging to attract wide-spread attention, the result being the appointment of the Royal Commission alluded to. Evidence given before it has been sufficiently startling to move an inert police force into action. It has been shown that gold has been bought on a large scale, and that in some instances no proper records were kept in contravention of the law on the subject. Several buyers have been haled before the courts, and have been called upon to explain how they came in possession of the gold. Allegations have been made that those interested in illicit gold dealing erect retorts and assay plants; sometimes almost in their drawing-rooms; in other instances, hidden away in the bush or in discreetly constructed outhouses. Cases have been known where mines have been worked ostensibly for gold, but really to provide a small quantity of stone to mix with the rich ore stolen from the mines. It can thus be seen that the business was conducted on a large scale and with such system as to prove that it must have been a profitable venture. There have been recriminations The police have been charged with neglect to enforce the law, and they in turn have accused the mine manage-

ments of laxity in supervision. The truth would appear to be somewhere midway.

Calumet, Michigan.

Good Progress at the Centennial.—Bottom Workings in Good Ore. Another Shaft on the Allouez.—Calumet & Hecla Sinks No. 17 Shaft.—Water for the Michigan.—The Champion Dividend.—Re-opening the Cliff Mine.

Excellent ore is being exposed by the lower levels of the Centennial mine. It is expected that the Centennial's output this month will be the largest in the history of the property. For more than a year the mine has been adding to its reserves at the rate of over 10,000 ft. per year. Since the third stamp went into commission at the Centennial's Grosse Point mill, the mine has increased its shipments to 800 tons per day, and there has been a corresponding increase in the copper production. The laying of the skip-roads in No. 2 shaft to the 18th level was completed a short time ago and the tracks are now being ballasted. Work has started on the erection of the permanent Sullivan hoisting-engine for this shaft, the sandstone engine-house having been finished a short time ago. As soon as the hoisting-engine at No. 2 goes into commission, track-laying will be resumed below the 18th level and completed to the 27th, to which depth the shaft is opened to the full size of two compartments. The new Nordberg 60-drill compressor is expected this week. Its erection should be completed early next month, when the 25 drills now at work will be increased to 35, production and development work being enlarged correspondingly. The showing of rich ground in the 27th level drift south of No. 1 shaft continues. Rich ground was penetrated in that drift three weeks ago. This ground is beneath a rich portion of the 26th level and probably it is the same shoot. At the 30th level—the lowest point to which lateral development work is under way—the ore is rich. As soon as the new compressor is installed the Centennial will put 10 more drills to work, which will permit the opening of extensive reserves in anticipation of a further increase in production. Mr. H. F. Fay, the president of the company, admitted on his recent visit to the mine that a fourth stamp would probably be added next year to the Grosse Point mill. This will close the Centennial's heavy construction account.

The No. 2 shaft of the Allouez mine has reached the lode and sinking in bedrock was started this week. The overburden on the 80° dip of the shaft is 60 ft. deep and it was penetrated in exactly four weeks—a creditable record. The timbering is done in six-foot sets. The ground is dry and firm. Henceforth, for the next two years, sinking will progress at No. 2 through the barren rock necessary to reach the lode, which is 2,200 ft. distant. For the present efforts are being devoted primarily to the addition of reserves; drift-stopes are being opened so that the development work is furnishing a good volume of production. A 60-drill Nordberg compressor is to be erected at No. 1 shaft.

Preparations were begun by the Calumet & Hecla this week for the resumption of work in No. 17 shaft on the Osceola amygdaloid. This is the only idle shaft remaining on that branch of the property and is the most northerly opening. Work was discontinued there about five years ago, when some of the other shafts were closed down. Since then the other shafts have been placed in commission. No. 17 is down only 100 ft. or thereabout, and is not provided with a heavy equipment like that at the other Osceola amygdaloid shafts. It has a temporary shaft-house and hoisting engine, which are adequate for some time to come, however. The Calumet & Hecla a few years ago extended its railway tracks to a point 1,500 ft. north of No. 17 to a location known as No. 18. It was intended to sink a shaft there, a short distance from the Centennial's boundary line, but the plan was abandoned. With the resumption of work at No. 17, the Calumet & Hecla now has five active openings on the Osceola lode, all of which are a source of large production. The improvements at the Lake Linden stamp-mills permit a greatly increased tonnage to be treated, and much of the increase is coming from the Osceola and Kearsarge workings.——Sinking is likely to be resumed at the Old Colony soon. The drift which encountered a good showing of copper about two months ago at a depth of 700 ft. has continued in the same character of ground since then. It is believed that the lode is the same as that operated by the Isle Royale.

Plans are under consideration by the Michigan company for a tunnel to be driven under Lake Superior at Keweenaw Bay to provide water for the new stamp-mill that is being erected there. A shaft will be sunk to a depth of 70 ft., from which a tunnel will be driven 1,200 ft. under the lake. At the extreme end an opening will be made through the 30 ft. of lake-bottom, and the water will enter through this opening. Work is now progressing rapidly on the foundations for the Michigan mill.——



The Copper Region of Lake Superior.

Each rectangle is a township, six miles square.

Key to Mines.

1. Ætna	19. Tamarack
2. Empire	20. Osceola
3. Delaware	21. Tecumseh
4. Amygdaloid	22. Rhode Island
5. Copper Falls	23. Franklin, Jr
6. Central	24. Franklin
7. Phœnix	25. Arcadian
8. Cliff	26. Quincy
9. Mohawk	27. Isle Royale
10. Ahmeek	28. Atlantic
11. Allouez	29. Baltic
12. N. Kearsarge	30. Trimountain
13. Wolverine	31. Champion
14. Mayflower	32. Belt
15. Centennial	33. Adventure
16. Tamarack Jr	34. Mass
17. S. Kearsarge	35. Michigan
18. Calumet & Hecla	36. Victoria
	37. Winona

The old shaft on the Hancock will be pumped dry by the end of the month. Drilling machines will be placed underground just as soon after that as possible and stoping begun. The Hancock produced 5,000,000 lb. copper during its former period of activity.——Hereafter work should progress much faster at the Keweenaw Copper Co.'s Medora mine, in Keweenaw county, as the steam plant went into commission this week. Previous to this time the Keweenaw did all of its drilling with hammer and drill, while the hoisting was done with a donkey engine. The new engine is good for a depth of 1,500 ft. The air-compressor is capable of operating 12 drills, and this equipment will carry the Medora's work through the exploratory period.

Work on the new office buildings of the Champion Copper Co. is practically completed. The Champion has declared a dividend of one dollar per share, which makes its total payments this year $800,000, or $8 per share. Provided dividends of $1 each are declared in November and December, its payments this year will be the same as last, namely, $1,000,000, one-half of which goes to the St. Mary's Mineral Land Co. and the other half to the Copper Range Consolidated Co.——Diamond-drill work on the Cliff property, owned by the Tamarack, continues. Unwatering of one of the old shafts, sunk in the early days to operate a fissure vein, has started. Much repair work on surface was needed to make the opening safe. The shaft cut many amygdaloid belts, which received no attention, and it is now proposed to investigate these lodes. Among the formations to be tested will probably be the Medora and Montreal amygdaloid, which are being developed on the Keweenaw and Calumet & Hecla lands a few miles eastward.

Butte, Montana.

The Goldsmith Flotation.—Butte Money in the Coeur d'Alene.—The Butte Copper Exploration Co.—Output of the Original and West Stewart.—Clark's Operations.—Production of Boston & Montana and Anaconda.

The Goldsmith Mining Co., with a capital stock of $3,000,000, divided into 300,000 shares, has been organized in Butte by those in control of the East Butte. The new company has taken over the Goldsmith mine, an old silver producer, which has been yielding copper lately at a depth of 400 ft.; also the Millside, Silver Safe, and the Tiger Lilly, four full claims lying west of the Alice mines of the Butte Coalition Co. The Goldsmith has been productive for several years; at a depth of 400 ft. the ore assays as high as 3½% copper. The directors of the new company are: C. W. Ellingwood, former owner of the mine, who will remain as general manager; Henry Mueller, Alexander Johnstone, Patrick Wall, and Charles R. Leonard. The Goldsmith is on the Rainbow vein, and, like the Alice and other mines on that famous lode, is expected to turn rapidly into copper with further depth. James W. Neill, who examined the East Butte and the United States mines, and upon whose reports those properties were organized into big companies, made the examination of the Goldsmith properties and reported favorably on them. Mr. Ellingwood is still working the Goldsmith and is employing 50 men. The ore is being shipped to the East Helena smelter. The stock of the new company will be underwritten at $5 per share, and 200,000 shares will be issued. Half that amount was underwritten in Butte on the day the company's organization was completed, the Clark interests taking big blocks of it.

A strong effort is being made to make Butte the headquarters for Cœur d'Alene mining stocks, because Butte men have invested largely in the mines of that district. A great deal of Butte money has gone into the Snowstorm and Snowshoe mines, and several mining experts, representing large interests, have thoroughly examined these two properties. The Snowstorm is producing 250 tons of ore daily that runs about 6% copper, and it is claimed that more than 1,000,000 tons of the ore are blocked out. Rapid progress is being made in the Snowshoe in driving for the Snowstorm vein.

The shaft of the Butte Copper Exploration Co. has reached a depth of 1,000 ft., and the company is now engaged in sinking a sump and station, which will take about two weeks. On the completion of this work a cross-cut will be run north to the veins. Although the company has encountered some spots of ore in the shaft, there has been found nothing to justify any special booming of the enterprise. The property is, however, so located that great expectations are warranted. The company owns eight mining claims in one group, comprising 93¼ acres. It owns the Cora placer, a strip of ground on the Greendale placer owned by the Butte & London Co.; it owns the Golden Chief, East Golden Chief, Anvil Fraction, Grand Prize, Six O'Clock, Baltimore Fraction, and the Maryland lode claims. There are a number of known veins in this ground. At the west end of the Golden Chief there is a shaft 125 ft. deep that was put down about 18 years ago; this shaft shows a good vein that carries 3½% copper and pieces of copper glance, but ore of that grade was not considered of much value at the time the work was done. On the same claim is another vein with a wide cropping. The company has 3,000 ft. on the two veins. On the Anvil Fraction there is a vein that strikes northwest-southeast, and is 30 to 40 ft. wide. On the Grand Prize there is a vein about 30 ft. wide on the surface. The Six O'Clock is the main vein and it is 90 ft. wide. The same vein also runs through the Grand Prize, as is shown by cross-cuts. Samples have assayed as high as 6% copper. Rapid progress has been made in sinking the shaft and equally good speed will be made in running the cross-cut. It is expected that one of the veins will be cut about the middle of December.

W. A. Clark's two mines, the West Stewart and the Original, are yielding almost all the ore that is treated by the Butte Reduction Works. The production varies greatly, ranging from 700 to 1,100 tons per day for both mines, of which about two-thirds goes through the concentrator, and the rest is first-class ore, ready for treatment in the smelter. The Original, which produces rather more than half of the output of the two mines, lies between the Gagnon and the Parrot, both belonging to the Amalgamated. But the strong vein in the Original seems to have held better ore all the way down than in the adjoining mines. The Original has reached the 2,000-ft. level, and stoping is being done there. The ore is low grade, a decrease in value being noticed below the 1,600-ft. level, as has been the case in the Amalgamated mines to a certain extent. Nevertheless, there is ore enough in reserve so that the company does not see fit to sink at present, in order to explore deeper, where the Anaconda has found large orebodies. The Original vein is 50 ft. wide on the 2,000-ft. level. The West Stewart is down 1,900 ft., and a cross-cut is being run to the vein on that level. It shows the same lessening in value of the ore below the 1,600 level as does the Original. The only important development work being done by Clark is the sinking of the shaft on the Elm Orlu claim, near the Butte & Superior group. There is ore enough blocked out in the two productive mines to keep the Butte Reduction Works busy for some years, but Clark appears to realize that the future of the district is dependent on the territory outside the present limits of the copper zone, and the active working of the Elm Orlu is pretty sure to

give a large reserve of high-grade copper ore, while there is every reason to believe, from the experience in neighboring mines, that the upper levels will yield silver.

Work has been resumed on the West Colusa mine of the Boston & Montana Co., and about 400 tons of ore will be added to the daily output of that company. The Boston & Montana is now shipping about 3,400 tons of ore daily, and 1,500 tons of it comes from the Mountain View. The ore assays about 5% copper. —— The Anaconda Co. is shipping about 3,600 tons of ore daily from its mines, and it assays from 3½ to 4% copper.

Toronto, Canada.

Prospecting the Gillies Limit.— Demand for Reports of Ore Shipments at Cobalt.— Further Flotations.—Wondertul Ore in the Nipissing. —The Laurentian Ships Specimen Ore.—Mineral Discoveries in the Laurentian Range.

E. T. Corkill, Provincial Inspector of Mines, returned this week from the Gillies Limit, Cobalt district, where he was for some time in charge of development work. He reports that good progress is being made in sinking the 75-ft. shaft, which it is expected will be finished about December 1, when the value of the 6-in. vein will be definitely ascertained. Systematic trenching has disclosed a number of other veins, carrying silver in paying quantity, such as if owned by private individuals would bring large figures in the market. —— An agitation is being started for the publication of regular official reports of shipments of ore from Cobalt. At present all that is required from mine-owners in the way of information is a quarterly return to the Bureau of Mines, and this is not available to the public until some time after the returns are made. No details of an official character have been given for months. It is proposed that a weekly report of the ore shipments over the Temiskaming & Northern Ontario Railway shall be given for publication. Frank Cochrane, Minister of Lands & Mines, has expressed himself favorably on the proposal.

Large financial deals in Cobalt properties are reported almost daily. The McLeod-Glendinning mine, formerly known as the Hanson mine, in the district between Cross and Kerr lakes, has been sold to McCornick Bros., of New York and Salt Lake City, for $600,000. The sellers paid $400,000 for the property in May last. It comprises one vein that has been opened to a depth of about 30 ft., and several as yet undeveloped. The Green-Meehan mine, two miles north of Cobalt, in Bucke township, has been bought by a syndicate of New York, Toronto, and Ottawa capitalists for $250,000. Ore valued at $30,000 was recently taken out in three days with pick and shovel. W. Y. Soper, of Ottawa, is a prominent member of the purchasing syndicate.——Prof. W. E. Hidden, mineralogical expert for the Nipissing Mines Co., states that the company on October 19 shipped $60,000 worth of bonanza ore, and has now 33 bbl. ready for shipment. About 1,800 lb. are put in each barrel. The shipments for September brought about $250,000, and for October from vein No. 49 alone they will double that figure. A pile of picked ore at the mine about 10 ft. diam. and 4 ft. high, was valued by the Professor at $100,000. Two cars of high-grade ore were shipped to the smelter from the Silver Queen on October 24, and another car will be sent within a week. The Nancy Helen Mines, Ltd., has been organized, with W. R. Smyth as president, and William Black, secretary and treasurer. The properties are situated in the town of Cobalt, adjoining the Buffalo, where a shaft has been sunk 60 ft., and two carloads of ore are ready for the smelter. —— J. L. Englehart has been appointed chairman of the Temiskaming & Northern Ontario Railway Commission.

Anthony Blum, principal owner of the Laurentian gold mine, in the Manitou district, has forwarded to Boston 300 lb. of ore to be placed on exhibition in that city. It is estimated that from three-fourths to four-fifths of the ore is gold. Some samples showed the rock almost hidden by the gold with which it was encrusted. —— At the Redeemer gold mine, in the Dryden mineral belt (R. W. Eames, superintendent), a cross-cut is being run from the present shaft to a 75-ft. dike, the distance to which is 350 ft., of which 125 ft. have been cut. —— L. O. Armstrong, colonization agent of the Canadian Pacific Railway, reports two valuable discoveries in the Laurentian range within 100 miles of Montreal. Extensive deposits of uranium and pitchblende have been found to occur in association with the mica mines of that region. A large deposit of graphite has been found as an outcrop, scattered so loosely that a couple of men can pick up two tons per day without blasting. The graphite is about three miles from the railway.

Salt Lake City, Utah.

New Concentrators Under Construction.—Plant for the Nevada-Douglas Copper Mines.—Heinze's Purchases.—Dividends.—Local Business.

Notwithstanding the fact that labor has been scarce and progress has been considerably handicapped, the new mill of the Utah Copper Co., at Garfield, 15 miles west of Salt Lake, will be completed on schedule time. It will be ready for commission early next year, and will, when the second unit is finished, handle an output of 6,000 tons of ore per day. The Boston Consolidated Co. is also pushing construction on its plant, which is to handle 5,000 tons per day, and if everything goes well it will be ready for business in April next. The Markham Gulch Milling Co. has let the last contract for material and equipment, and the plant to be erected in lower Bingham will supply a place for the treatment of 200 tons of ore daily from the Utah Apex and Utah Development mines, at Bingham.

Walter C. Orem, the manager of the Nevada-Douglas Copper Co., has closed a contract for a large equipment of machinery, which has been ordered shipped to Yerington, Nev., without delay. This company is executing plans mapped out some time ago to operate its property upon a large scale, and late reports indicate that it is likely to develop into one of the big copper mines of the West. Some high copper assays have been obtained, but the great bulk of the ore opened is low grade and will pay handsomely only by handling a large tonnage. The average of the Yerington ore, however, assays better than that of the mines of either Bingham or Ely.——The management of the Newhouse Mines & Smelters Corporation, operating the Cactus mine, in Beaver county, has closed a contract for the immediate construction of forty cottages for the accommodation of employees.

Although nothing has been given out officially, there is little reason to doubt that the Ohio Copper Co.'s mine, at Bingham, has passed into the control of F. Augustus Heinze. The option has been pending for some time. Mr. Heinze is also a controlling factor in the development and equipment of the Gold Hill mine, in the Clifton section of the Deep Creek district, which recently formed the basis for the organization of the Western Utah Copper Co.——Some rich phosphate deposits have been opened in the extreme northeastern part of the State of Utah and extending into Idaho and Wyoming. The ground has been acquired by the Union Phosphate and San Francisco Chemical companies.

Among the Utah mines that paid dividends and the amount of each were: Silver King, Park City, $50,000; Utah, Fish Springs, $3,000; Sacramento, Mercur, $5,000;

nd the folowing from the Tintic district: Beck Tunnel 'on., $30,000; Mammoth, $20,000; Grand Central, 15,000; Victoria, $10,000; Carisa, $5,000.——The ore nd bullion settlements in Salt Lake last week amounted o $924,000; during the same period $161,709 represented he value of 293,593 shares of stocks sold on the floor of he Salt Lake Stock & Mining Exchange.

Leadville, Colorado.

he Yak Tunnel.—New Orebody in the Penrose.—Prospecting in Iowa Gulch.—Encouraging Find on Ball Mountain.—Good News From New Monarch and Weldon.—Great Activity on Breece Hill.

Early snows have hindered mining operations in the utlying districts and practically stopped all surface pros- ecting.—The Yak Tunnel Co. is quietly but persistently xtending the net-work of laterals from the great bore. ompanies which own property in the vicinity of this dit realize its importance as a means of developing their roperties economically, and, as a result, the laterals are eing extended from numerous points into both Iron and reece hills. Many mines which have laid idle for ears will become profitable as a result of these advant- ges.

By means of drifts and drillings from the Penrose orkings north of Seventh street, the expectations of the anagement—that the great ore-shoot below the parting uartzite in the Coronado continues to the west—have en confirmed. A sulphide body of undetermined ex- nt has been found west of the new fault, the latter dis- acing the orebody about 250 ft. The fault has a north- sterly direction and passes a short distance north of the pronado shaft. The newly located orebody is probably e extension of the Coronado shoot now being worked to e east of the fault. Raises in the same territory show rge bodies of first-contact iron familiar in the early wn-town operations.

Judge A. T. Gunnell, of Colorado Springs, has given option on an undivided three-fifths interest in the cy L. mine at Camp Harrington for $25,000. Judge nnell has owned this property for many years, but of te no work has been done on it. The new management ntemplates adding immediately an efficient hoisting ant, along with other machinery required to put the ine on its former productive basis. It is reported by e manager that a large body of ore of a shipping grade ll become available with the completion of the contem- ted improvements.—From the lower workings of the ntinental Chief, located in Iowa gulch, ore is being pped to the extent of 50 tons per day. During the mmer months a large amount of prospecting was done Iowa gulch, and it is reasonable to predict that this ality will soon become one of the most important of the tlying districts.

A recent strike, probably the most important for the nth, was made in the Thatcher on Ball mountain. A ft from the shaft broke into an orebody, of solid galena eral feet thick. For some time past small shoots of lena ore had been encountered in the Thatcher during progress of driving. This ore is unusually rich in ver, and although it is too early to predict its extent, discovery of the new shoot will give increased im- tance to Ball mountain mines in the future. About ft. distant from the above property is located the day mine, which was formerly a heavy producer of s class of ore. Large areas of Ball mountain are med with small fissures carrying galena and such perties as the Leopard, Ontario, Tiger, Helena, and ers show strong indications of valuable galena deposits. The rich shoot opened up in the New Monarch two nths ago still continues to furnish valuable ore, and in addition there has been opened up to the west of the Winnie shaft, a large body of 6 to 9-oz. gold ore. It is worthy of note that the production of gold from the deeper workings of all properties has for months been on the increase.—Greater activity is noted among the Breece hill properties; such mines as Highland Chief, Gold Basin, Winnie, Big Six, Penn, and Bollard have been recently added to the old producers. The Triangle mine has experienced unusual difficulties in putting the 900-ft. shaft in order, as, in addition to the water, the shaft was filled with old timbers. This property will develop 24 acres of virgin ground in a favorable locality on Breece hill.—The Weldon property, situated near the Penrose, will resume operations within the next thirty days. Lessees have worked this mine for several years in a small way, but a complete overhauling will now be made.

Cripple Creek, Colorado.

Growing Use of Electric Power.—Several Dividends.—Successful Leasing Operations.—New Companies Organized.—The Snowstorm Hinders Work.—Prosperous Activity.

The Extra claim, owned by the Grace Gold Mining Co., on the south slope of Squaw Mtn., has been started up again. Lessees have taken over this property and are installing an electric hoist, their intention being to sink the shaft, which at present is 100 ft. deep. This property adjoins the Home Run and Santa Rita mines, on which so much development has been done of late under the direction of Sherman Bell, general manager.——The British American Mining Co., Ltd., operating the South Dante, on Bull hill, has declared its first dividend of 10% on a capitalization of $10,000. Work has been in progress on this property for the last 18 months, various difficulties having been encountered at times, seriously hindering operations. Everything is now in good shape, there being several hundred tons of ore, which will average better than two ounces in gold, already broken in the stopes. This lease is one of the best in the district. It belongs to Becker & Travell, who also have a lease on the Christmas mine, on Bull hill, which has paid an initial dividend of 25%. This lease is also in good shape for producing a large tonnage of fair grade ore. The electric-driven Norwalk compressor is now in running order and five Ingersoll-Sergeant drills will at once be put to breaking ore. This eight-drill compressor was originally driven by steam, but the steam end has been disconnected and the air part geared to a 100-h.p electric motor.

The Western Mining & Leasing Co. has been incorporated. It is capitalized for $100,000 and is to operate in Teller county. The directors for the first year are George F. Fry, C. S. Buck, T. C. McDonald, H. M. Finney, and F. M. Woods.

The recent snowstorm has hindered mining operations, the railroad spurs to the various mines being blocked with snow. Hauling was also stopped for three days and several of the smaller properties are now suffering from surface water.——Ore is being shipped to the Anaconda cyanide mill from the Lexington mine on Gold hill. It is obtained from a large deposit of semi-oxidized material in the South Clara D. workings and is conveyed on a tramway to the mill, about 40 tons per day being handled. This mill is also treating ore from the Colorado Boss, situated about half a mile to the east.——The cross-cut on the 800-ft. level of the Cresson mine, on Bull hill, is advancing rapidly and it is hoped that the large orebody encountered above on the 600 and 700-ft. levels will soon be cut. This mine belongs to the Bull Hill Mining & Developing Co., Richard Roeloff being superintendent. A new 12-drill compressor is being installed, it is to be electrically driven, the motor being already on the ground. The output for October will approximate 1,600

tons.——The production of the Little Clara lease on the Work property is being maintained both in tonnage and value. Owing to the recent snow, the ore has accumulated in the bins and it is estimated that there is in the neighborhood of 800 tons on hand averaging between three and four ounces. Royalties to the amount of $12,000 were paid to the Work Co. by the lessees during the month of September, representing an output of $125,000 in value.

A discovery of ore has recently been made in the old Davenport shaft of the Doctor-Jack Pot Co., on Raven hill, by Smith & Altman. The vein was encountered in the lowest workings of the mine and 150 ft. deeper than any ore previously found in the mine, or in any other mine in that locality. It was cut 70 ft. south of the shaft and averages $60 per ton.——Mineral hill, one of the comparatively barren spots of the district, has produced from the Laura Lee claim a shipment of 40 tons of ore, which ran a little better than $20 per ton. This is the first shipment to be made from this locality for years and the event has caused the starting up of other propositions in the vicinity.——Large shipments are being made by the Western Investment Co. from its Stratton Estate leases, operating on the Orpha May, Sacramento,. and Specimen claims. Austin T. Holman, formerly general manager of the Golden Cycle Co., is president of this company. Ten cars per week, on an average, are being shipped from these properties, the ore running between one and two ounces.

Articles of incorporation have been filed by the Pharmacist Leasing Co. to operate on the Pharmacist property on Bull hill. It is intended to sink the shaft, which is 600 ft. deep, another 300 ft. and to do other extensive development. The directors of this new company, for the first year, are Clarence Edsall, H. N. Todd, and John H. Hobbs, all of Colorado Springs, and interested in various mines in this district. D. W. Mason is superintending the work of this company.——The El Paso Gold Mining Co., on Beacon hill, is shipping about 2,250 tons per month on company account and from various leases. This is a good showing considering that some of the best ore is under water just at present. The Lambright lease, belonging on this property, ships 750 tons per month and the Lonaconing about 400, the El Paso mine itself contributing the remaining 1,100 tons.——A new orebody has been encountered in the Forest Queen mine on Ironclad hill.

The discovery was made at a depth of 550 ft. and 200 ft. east of the shaft. The screenings from this orebody, which is said to be of fair dimensions, run over two ounces per ton, the coarse averaging a little over one ounce. About three cars per week are being shipped.——The Vindicator Consolidated Gold Mining Co. has declared the regular quarterly dividend of three cents per share, amounting to $45,000. A report on the mine by the general manager, F. J. Campbell, has been sent to the stockholders, showing the profit for July, August, and September to be $54,799. This is encouraging, considering that one-third the cost of operating was spent on development. New boiler-furnaces, permitting the use of lignite coal, have been installed at a cost of $4,500, and it is expected that they will save approximately 25% of the former fuel cost. During the three months there were shipped on company account 6,299 tons of ore having a gross value of $156,855, giving a gross value per ton of nearly $25. On lessee's account 1,116 tons were shipped, the gross value being $20,405 and the average $18.28 per ton. Incidental receipts brought the total up to $178,760. The operating costs were $104,326, of which $51,557 was for labor. Money paid to lessees and taxes makes a total expenditure of $123,961.

Mining Summary.

ALASKA.

The latest and one of the most valuable discoveries made in the new northern copper camp, west of Whitehorse, is that by Byron N. White, of Spokane, Wash., on the Pueblo. He has uncovered on the Pueblo a body of ore 250 by 270 ft., and has sunk about 100 ft. and has not, as yet, found either wall. The ore is almost solid hematite, heavily impregnated with copper minerals. This whole body is practically shipping ore, and will average in the neighborhood of four per cent copper, with some gold. There are masses and streaks, however, of high-grade ore forming a large proportion of the orebody. Cuprite and copper glance occur in considerable quantities, with some native copper and bornite, chalcopyrite, and the carbonates are thickly disseminated throughout the ore, so that, with only rough hand sorting, high-grade shipments can be made. It is certainly an enormous surface showing. He is shipping 100 tons at present.

ARIZONA.

MOHAVE COUNTY.

At the Banner mines of the Arizona-Mexican M. & S. Co., at Stockton Hill, a body of ore four feet wide has been enencountered. The ore is solid from wall to wall and carries ruby and native silver in quantity, besides running better than 40% lead.——The Gold Roads mine is yielding bullion at the rate of $60,000 per month, but the output will be increased to $80,000 as soon as electric power from the Kingman plant becomes available. The shaft has just reached the 700-ft. station. On the sixth level the main ore-shoot has been opened for a length of 700 ft. and is 10 ft. wide. The present output is 125 tons per day, and with electric power will be 200 tons per day with the same plant. The ore yields readily to amalgamation and cyaniding, and the saving is 91½ per cent.

YAVAPAI COUNTY.

(Special Correspondence).—The Chronicle mine, at Prescott, is exciting more than usual interest. From a depth of 25 to 65 ft. the shaft, and the series of cross-cuts run from it, have all been in ore that carries high-grade values in gold and copper, the extent of the orebody being yet undetermined. At 650-ft. a horse was encountered in the sinking of the shaft, and this continued for a distance of 10 ft., when the orebody again re-appeared on the west side of the shaft, giving better gold and copper assays than the body passed through nearer the surface. Work on the shaft is being pushed with energy and a new hoisting plant, recently purchased, will be installed as soon as delivered. When a depth of 100 ft. is reached, drifts will be run in both directions along the vein and a series of cross-cuts run through the ore. There are five claims in the group, all of which are to be developed as fast as practicable. The claims and mine are situated four miles from Prescott, immediately east of the wagon-road running to McCabe and in the vicinity of the Four Mile house, in a district which has been traversed by miners and prospectors since the first settlements in Prescott and Lynx creek in the early sixties.

Phœnix, October 29.

CALIFORNIA

CALAVERAS COUNTY.

The Zeila Co. has put in a flume from the tailing plant to a point down the creek about 400 ft. for the purpose of carrying off the debris.

FRESNO COUNTY.

John S. MacArthur has finished his examination of the Fresno Copper Co.'s property and has left for Glasgow. His report is not likely to be cheerful. There is a large body of pyrrhotite containing about 1.7% copper, but under present conditions this is not profitable. Herbert Lang is said to favor smelting operations with the aid of custom work on silicious material. When the new Guggenheim smelter at San Bruno, near San Francisco, is completed, the ore of this mine may become available.

KERN COUNTY.

J. Frank Walters, of Los Angeles, has bought the Echo mine at Mojave, and will soon resume working the mine and mill with A. M. Peck as superintendent.——The Bobtail mine has been purchased by the same company. The new group consists of 17 claims and has a 20-stamp mill and cyanide plant.

NEVADA COUNTY.

The excavating for the new mill at the Cold Springs gravel mine has been completed and the work of erecting the building will be begun immediately, as the lumber is now on the ground. A new reservoir will be built on the hill above the millsite.

PLACER COUNTY.

At the Dairy Farm mine, now being developed by Guggenheim interests, a large water tank is being erected. Being situated in the foothills, the supply of water is a serious difficulty.

SAN BERNARDINO COUNTY.

The Pasadena Con. Mining Co. has decided to sink shaft No. 4 on its mines west of Gold Roads from 55 to 600 ft.



California.—Showing Position of the Counties.

This work will also embrace the blocking of ore at intervals of 100 ft. and cross-cutting the vein wherever it is thought advisable. O. C. Ainsworth is president of the company. The mines of this company are on the same belt as that of the Blue Ridge mines and are northerly extensions of that property.

SHASTA COUNTY.

There is great activity in Shasta county not only in the copper mines but also in those supplying siliceous ores for flux. In the Old Diggings and Quartz Hill districts a steady output is being maintained and several of the chief mines are bonded by the smelting companies while some are being worked by them under a royalty.——A railroad will soon be built for the transportation of these ores to Central Spur on the Southern Pacific.——At the Reid mine, one of the most important producers at Old Diggings, a small fire broke out recently in the lower workings, but was easily extinguished by flooding.——Surveyors are working on the railroad location between Kennett and Delamar.——At Heroult, the new camp at which experiments in the treatment of iron ores are being made, grading and building is progressing rapidly ——The question of railroad connection with the Afterthought smelter is under consideration, and the relative advantage of the two means of approach are being considered. A road could either be built up the Pitt river passing through a mountainous country tapping good supplies of limestone and timber, or else from Bellavista through a more level but arid country.——At Coram the laying of track to the smelter site is completed. The extension of the spur to the charge-floor level is being graded and trestles built. The forms for the foundations of the furnaces are in place and the heavy grading for the smelter site wil soon be finished.

SISKIYOU COUNTY.

Owing to scarcity of water the Ethlyun hydraulic mine at Horse Creek was shut down last week until the winter rains begin. The sawmill is to be started again this week in getting out more lumber for fluming, and will be run by a water-wheel, the engine and boiler having been smashed completely during a heavy hail storm blowing a large tree over the engine room last July.

The Mono quartz mine on Punch creek, a tributary of Humbug, is kept running constantly with good success, yielding an average of between $5,000 and $6,000 per month. Some 23 men are employed in the mine and mill which treats 15 tons per day. The mine is being gradually developed on an extensive scale, and in the near future will require a larger force of operators. All the machinery is run by electric power of the Siskiyou Power Co. This claim is within nine miles west of Yreka, on the new road over Humbug mountain.

TRINITY COUNTY.

At the Bonanza King mine, 20 stamps are now ready for operation.

The scarcity of labor and supplies is a serious hindrance to the general industrial activity. The Bonanza King Mining Co. is paying a bonus of 30% on wages to men who stay for a month. One hundred men are working on the erection of the 40-stamp mill.

The different gravel mines in the county have completed arrangements for the coming season's run. The Hupp Brothers have got their bedrock cut finished and are now laying the flume. Last year they were obliged to shift from their old workings to a knew position. Now good opening has been obtained and everything will be ready for the first run of water, and an unusually large amount of ground will be moved.——La Grange, the most extensive hydraulic mine in the State, has completed the many improvements undertaken early in the year, and will be ready to commence the season's run with the first fall of rain. With the addition to the water that the tapping of the lakes at the head of Stuarts Fork will supply, the company will undoubtedly have a full head of water as long as it is possible to use it.

TUOLUMNE COUNTY.

(Special Correspondence).—Since the cleaning and retimbering of the 200-ft. shaft of the North Star was finished, the north drift has been extended 70 ft. It is now 100 ft. long and almost its entire length is in good milling ore averaging eight feet in width. W. G. Phipps, the superintendent, reports that it is the intention to begin sinking again at an early date and contine until the shaft reaches 500 ft. Within a few days the work of repairing the 10-stamp mill will be begun. One month will be required to complete this, when crushing will be resumed. There is 800 tons of ore on the dump.——The machinery for the 100 stamp mill purchased by the United Mines Corporation, owner of the Grizzly, New Albany, Dead Horse, and Lady Washington mines, has arrived in Tuolumne and is being conveyed from this point by teams. Work of erecting the mill will begin at once, the grading being nearly completed. The ditch and flume which convey water from the North Fork of the Tuolumne river to the Grizzly mine, where the new mill will be placed, are being re-built. Twenty carloads of lumber have been delivered to a convenient point on the Hetch-Hetchy and Yosemite Valley railroad for this purpose, and a crew of 30 men is engaged in the work of reconstructing the conduit. A 300-h.p. two-cylinder air-compressor has been received and another of the same size and pattern has been ordered. Underground work is being vigorously prosecuted at the Grizzly. A new hoist will be put up at the New Albany, the mine unwatered and the shaft enlarged. In time the Lady Washington adit will be extended to the workings of the Dead Horse, which will be

tapped at a great depth. The four properties are excellently situated for such a project as the United Mines Corporation has under way—working them all virtually as one.——A 150-h.p. electric motor is being installed at the Eagle-Shawmut mine so that the property can be under partial operation during the shut-down period. Power will be obtained from the Standard Electric Co. and everything will be kept moving except the 100-stamp mill, which will stop crushing within a few days. During this period of semi-activity about 60 men will be employed.——The 10-stamp mill of the Don Pedro mine was destroyed by fire last week, the loss being about $10,000, partially covered by insurance. The company intends to re-build at once. The mine employs 20 men and sinking and driving is in progress.

Tuolumne, Oct. 29.

COLORADO.

LAKE COUNTY.

After thoroughly testing the mineral bodies of the Ida-May group, and having blocked out sufficient ore to warrant the expenditure, the Sargent M. & M. Co. has purchased an amalgamating and concentrating plant at Granite, and will move it this week to Sayers Gulch.

SUMMIT COUNTY.

(Special Correspondence).—For five months three drilling machines have been constantly employed in prospecting and systematically testing the Swan river placers, the work being done under the supervision of Mr. Tuttle, a California mine operator, at a cost of about $30,000. J. Parke Channing, of New York, then came out, and having made a thorough examination of the ground and the results of the drilling tests, sent in his report, on the strength of which the option (held by Ben. S. Revett) was lifted. It is proposed to work this ground with four dredges similar in construction to that which is now being worked by Mr. Ben. Revett in French gulch.——During the season's hydraulic operations on the Banner placer some rich gold float was encountered and the further work of stripping the ground disclosed good indications for vein mining. Col. Kingsbury has secured a lease of some of this ground from the owners of the placer property, and intends to run an adit into the hill from the foot of Iowa gulch to prospect for the lode from which this float has been washed.

The Reliance dredge is making big clean-ups, and the result of this year's operations is most satisfactory. If the good weather holds out, work will continue into the month of November.

The Jessie mill is kept going to its full capacity. The company is now employing 30 men and is making a substantial profit; the whole aspect of the enterprise is extremely good under the able management of James T. Hogan, who has as superintendent Charles F. Gilbert. A small shipment of ore has been sent to Denver to be tried by the Hendryx electro-cyanide method, as it is thought a closer saving can be made by cyaniding the tailing, which now carries from $3 to $4 per ton.——A. C. Howard, the manager of the Bay State, reports that indications are favorable to the striking of a large body of ore in his main tunnel.——S. S. Woodbury is again working the Brewery mine, which is situated near the Lincoln in American gulch. This property has a good record for past production and is expected soon to rank among the shippers of the district. ——S. F. Stoughton, of Illinois, has secured the Fourth of July claim under bond and lease; he intends to work it and ship the ore to the Lenawee mill at Montezuma.——The Quandary Mountain Mining Co. has resumed operations and is now taking out ore. This is to be milled at the rate of 60 to 75 tons per day.

The Gold Dust has cross-cut the main vein in the workings below the winze from the lower tunnel. The lode is 12 ft. wide, 4 ft. of which is silver-lead ore of smelting grade while the remaining 8 ft. is suitable for concentration. The hoist and pump are run by electric power. James L. Callbreath, of Denver, is manager.

The Wellington mine is daily improving in value by adding to its large ore reserves. When the new 300-ton mill is erected, it will have ample material to treat for years to come.

Breckenridge, Oct. 29.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The directors of Le Roy Mining Co. met this week and decided to put in a steam-hoist. A 70-h.p. boiler will be installed and the head-frame is already being constructed. The shaft, which is down 265 ft., is being straightened. Assays have run as high as $80 per ton on this property, but the main body of ore is averaging $12 per ton and it is generally conceded to be a very good low-grade proposition.——The Quartette is using water from the Drake shaft in the mill on the main property. On the 800-ft. level the values are increasing as they drive. This mine, which has been a large dividend payer for the past few years, appears to have an inexhaustible body of ore blocked out.——At the new camp Thurman, William Holt and C. A. Thrull, Los Angeles capitalists, have secured ten claims located near a spring of water close to the original discovery. They will also start a townsite on their claims, developing some of them for mining properties. They will also work a claim in the Winner group, near Searchlight.



Part of Nevada.

On the original Thurman-Hamill strike, at ten feet, paying ore has been struck.——The cyanide plant on the Searchlight M. & M. Co.'s property, with a daily capacity of 100 tons, is completed and ready for operations. The two 70-h.p. boilers are in operation.——The Pompeii has ordered a large steam-pump in order to remove 40 ft. of water in the bottom of the main shaft. The present gasoline pump is too small for the work. The intention is to resume active mining as soon as the water is under control.——The Cyrus Noble Extension, which adjoins the Duplex and the Cyrus Noble, has ordered a hoist. They are down 190 ft., with good showings, improving steadily with depth.

Eldorado Canyon, 18 miles from here, is developing fast and all their supplies are hauled from Searchlight by team. They have plenty of water; this is an old camp lately revived with several new strikes.——The Gold Dyke Mining Co. has a vertical shaft 103 ft. deep and a 50-ft. cross-cut to the south. The same lead found on the Blossom and Pompeii is plainly traceable across this property. They cut a 20-ft. vein of ore which assays from $15 to $40 per ton. The company's officers state they will sink to the 500-ft. level whether water is encountered or not, and will also put in milling machinery.

Searchlight, Oct. 26.

NYE COUNTY.

The Belmont-Johnnie has started work by sinking a shaft on the White Car claim on a vein that lies very flat and has lime on the foot-wall. A tunnel is also being driven on the Wellington claim on a vein averaging five feet in width and assaying $8. The Johnnie Consolidated is working two shifts in the main shaft from the 300-ft. level to surface; the north cross-cut on the 700 shows five feet of ore averaging $20. On the 600-ft. level, the south cross-cut is in ten feet of ore, three and a half averaging better than $100 and the

whole mass averaging $35. In the north drift the formation is very flat and the full width of the vein has not yet been determined.——Two shifts are working in the Globe lower tunnel to reach a rich shoot exposed in an upper tunnel. A depth of 25 ft. from the surface has been attained. ——The working shaft on the Golden Eagle claim of the Bullfrog-Johnnie is being re-timbered from surface to the 50-ft. level.——A shaft is being sunk on the Runaway Girl claim of the Pittsburgh-Johnnie on a vein running parallel with the Golden Eagle. It assays $30 in gold and 20 oz. silver and about 50% lead.——Robert Browne's copper property, the Johnnie-Wonder, has a blanket vein, the footwall of which has not yet been cut. Assays show 35% copper and $5 in gold.——The Minnie Mae lease No. 4 has been taken by S. R. Phail, of Rhyolite, who is extracting milling ore averaging about $20.——The Sunshine mines have been sold by Robert Atkinson, of Los Angeles, to a Philadelphia syndicate, headed by C. F. Sessinger and R. J. Purcell. This property is in the copper belt, adjoining the Johnnie-Wonder.——The Red Chief and Grey Rooster claims have been bought by Taylor and Griffith, of Rhyolite.

WHITE PINE COUNTY.

The Nevada Con. Copper Co. and the Cumberland-Ely Copper Co. will jointly build a concentrating and smelting plant. It is proposed to organize a $10,000,000 smelting



New Mexico.

company, in which the two copper companies will each own a half interest. The smelter will be of sufficient capacity to handle not only the Nevada Con. and the Cumberland-Ely ores, but it will treat ore for other mining companies in the Ely district. The joint interests have already acquired about eight square miles of watershed in the vicinity of McGill, about 20 miles from Ely, which will furnish a supply of water to treat at least 25,000 tons of ore without re-pumping, and in addition the precaution has been taken to acquire all the ranches in the territory which might suffer from the loss or polution of the water, or damage from the smelter fumes, and by this means all future trouble from damage suits, such as have been a source of heavy expense in the Butte and Utah copper dstricts, has been obviated. Part of the plan includes the purchase by the Cumberland-Ely company of one-half interest in the Nevada Northern railway, running from Ely to Cobre, on the Southern Pacific line, now owned by the Nevada Con. Company.

NEW MEXICO.

OTERO COUNTY.

The Fleming-Fox Mining & Smelting Co. is doing development work upon an extensive scale in the Jicarilla district. W. G. Fleming, president of the company, visited the mines last week. A steam hoisting plant is on the way to the mines from Chicago and will be erected on the new shaft of the copper property, which is down 50 feet.

DONA ANA COUNTY.

Another noteworthy strike is reported from the Torpedo at Organ. In unwatering a portion of the mine, a vein five feet wide of high-grade copper ore was uncovered. The strike was made in an old portion of the mine which had been worked under former owners, but the working had to be abandoned when the water drowned the mine. Recently the mine was sold and large pumps were erected which are rapidly unwatering the old workings. In these old workings were found steel drills, drilling hammers, the rails of a tramway, and other tools, showing that the workings were abandoned in haste when the water was struck.

TAOS COUNTY.

The Hawkeye group of mining claims, near Amizett, has been purchased by the San Cristobal Mining Co., which is working a group of mines on the South Fork of the Rio Hondo. There is a mill on the Hawkeye, and the group carries large quantities of copper of a good grade. Extensive development work is to be done this winter.

GRANT COUNTY.

The Burro Mountain Copper Co. has blocked out a large body of copper ore on the fourth level of the Sampson at Leopold; this is in addition to the large bodies of ore blocked out in the second and third levels.

OREGON.

BAKER COUNTY.

Last week T. S. Van Vleet, manager of the Gold Bug, closed a contract with W. H. Potter for the immediate erection of a mill on that property. The timbers are all on the ground and the assembling of the machinery is under way.

CROOK COUNTY.

The Gatewood Mining & Trading Co.'s mill on the Mayflower mine started crushing ore. The mill has five stamps, followed by machinery. The ore is a sulphide, high grade and soft so that 20 tons per diem goes through the mill. Previous test-runs have demonstrated the success of cyanidation.

BRITISH COLUMBIA.

OUTPUT OF MINES AND SMELTERS IN THE BOUNDARY DISTRICT, B. C., FOR WEEK ENDING OCT. 20.

Mines.	Tons.	Mines.	Tons.
Brooklyn-Stemwinder	2,871	Rawhide	1,353
Centre Star	150	St. Eugene	652
Corinth	29	Skylark	20
Granby	13,205	Strathmore	24
Iron Mask	33	Sunset	576
Le Roi	2,250	White Bear	60
Lone Bachelor	22	Smelters.	
Mountain Rose	198	Granby	12,167
Nettie M	30	B. C. Copper Co.	4,998

A strike of importance has been made on the Cork mine near Kaslo, north of Spokane, Wash., a property owned by the Silver Star Mining Co., controlled by French capital. The new orebody lies near the hanging wall of what is known as the Cork lead, and was found on the 900-ft. level. The orebody is about four feet in width. The mineral texture is a very fine-grained galena, carrying scarcely any zinc. Assays yield 91 oz. silver, 72% lead, and 8½% manganese.

MEXICO.

The smelter of the Mazapil Copper Co., Ltd., which is being erected in Saltillo is rapidly nearing completion. Almost all the steel structures are up and much machinery has already been installed. Carloads of ore from the company's mines are arriving daily and are being dumped in the smelter grounds. The Mexican Gold Copper Co. is resuming work on the Utah mine. It has a well-defined vein 42 ft. between walls, which assays about 25% copper, $7 gold, and 20 oz. silver per ton. The Tres Amigos Gold Mining Co. also has several good properties.——The Parral Power & Reduction Co.'s preliminary electric power plant near Parral is nearly finished. The double main transmission line, 5½ miles long from the plant to the mines at Minas Nuevas is nearing completion also.

Personal.

W. L. AUSTIN is at Clifton.

F. LYNWOOD GARRISON is at Kingman, Arizona.

F. F. SHARPLESS has returned to New York from Mexico.

C. M. FUELLER has returned to Denver from Weiser, Idaho.

CHARLES PRINGLE is at the Isidro mine, near Chihuahua, Mexico.

J. ALLEN VEATCH is examining mines at Round Mountain, Nevada.

M. C. STAFFORD is visiting San Francisco from Kingman, Arizona.

HUDSON H. NICHOLSON has returned to Chicago from Goldfield, Nevada.

FREDERICK ROESER is superintendent of the Globe smelter, at Denver.

EDWARD W. RALPH is investigating the new goldfields in western Nevada.

HENRY Z. OSBORNE has returned to Los Angeles from a trip to Tonopah and Goldfield.

FRANCIS V. DRAKE, now resident at Bishop, Cal., has been on a visit to San Francisco.

C. M. EUAN-SMITH has gone to Buenos Ayres to examine dredging ground in the Argentine.

C. W. LININGER is in charge of the Tecolotes mine at Santa Barbara, Chihuahua, Mexico.

WILLIAM P. BLAKE has received an honorary degree from the University of Pennsylvania.

GEORGE A. SCHROTER has been appointed consulting engineer to the Dolores Mines Co., Mexico.

A. E. SAVAGE is manager for the Australian Smelting Corporation, at Kemble, New South Wales.

HOWARD D. SMITH has returned from the examination of copper mines in Inyo county, California.

R. GILMAN BROWN has returned from Chihuahua, Mexico, and is now at Ymir, British Columbia.

GEORGE BEEBE is general manager for the Cieneguita Copper Co. in the Sahuaripa district of Sonora.

JAMES F. KEMP, professor of geology in Columbia University, has returned to New York from Mexico.

H. R. PLATE, manager of the Nevada United Mines Co., at Ely, Nevada, has returned there from Denver.

D. M. BECK has been appointed superintendent of the Echo mine, at Mojave, in Kern county, California.

WILLIAM DAVIDSON has been appointed manager of the California-Nevada Copper Co., at Dalton, California.

W. A. FARISH has been examining mines at Magdalena, New Mexico. He will shortly open an office in New York.

F. WALLIS SMITH, assistant engineer with the Egyptian Mines Exploration Co., has returned to Egypt from London.

STUART R. ELLIOTT has returned from Cuba and is now superintendent for the Cleveland-Cliffs Co., at Negaunee, Michigan.

WILLARD J. MORSE has been making a tour of inspection among the A. S. & R. smelters in Mexico. He is now in San Francisco.

FREDERICK GRUNDY has returned to Los Angeles, having completed the examination of mines in Kern county, California.

H. J. ARKELL, assistant superintendent of the Siempre Viva mines, is visiting San Francisco from Bluefields, Nicaragua.

J. S. MACARTHUR is on his way home to Glasgow, having completed his examination of the Fresno copper mine in California.

FRANK ROBBINS has returned to Los Angeles, having completed a season's professional work in the Solomon River district of Alaska.

H. P. SIMPSON, assistant general manager of the Southern Department of the American Smelting & Refining Co., has resigned. He will be at New York shortly.

F. C. CARSTARPHEN, of the firm of Hewitt-Carstarphen & Co., Denver, has been doing consulting engineering work for the Portland Cement Co., at Portland, Colorado.

CLIFFORD G. DENNIS, manager of the Marfa & Mariposa Mining Co., fell down a raise 50 ft. deep, but escaped with only a few bruises. The daily press reported him seriously injured.

Dividends.

On November 5, the Bunker Hill & Sullivan Mining & Concentrating Co. will pay dividend No. 110 of $180,000. This makes the total paid since January 1, 1906, $1,980,000, and total to date $7,506,000. [We shall be glad to chronicle dividends paid by other mining companies.—Editor.]

L. VOGELSTEIN & Co., New York, state that the German consumption of foreign copper for the months of January to August, 1906, as compared with 1905, was:

	Tons.	Tons.
Imports in August	12,673	
Exports in August	828	
Consumption in August	11,845	
Imports January to July	74,842	
Imports in August	12,673	87,515
Exports January to July	6,183	
Exports in August	828	7,011
Consumption January to August, 1906		80,504
Consumption January to August, 1905		64,980

Of the above, 10,417 tons were imported from the United States.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, October 31.

Con. Virginia	$1.05	Manhattan Con	$0.85
Ophir	3.40	Jumping Jack	0.53
Savage	1.20	Midway	2.40
Tonopah Ex	7.35	Montana	4.35
Belmont	6.50	Mohawk	15.00
Jim Butler	1.65	Silver Pick	1.30
Jumbo	3.95	Sandstorm	0.86

METAL PRICES.

By wire from New York.

	Average Prices for October.	Closing Prices November 1.
Copper—Lake (cents per lb)	21¾	22 @22¼
" Electrolytic "	21¼	21.40 @22
" Casting "	20⅞	21 @21¼
Lead "	5.75	5.75
Spelter "	6.25	6.25@6.30
Silver (cents per oz.)	69.52	70¼

ANGLO-AMERICAN SHARES.

Cabled from London.

	October 25. £ s. d.	November 1. £ s. d.
Camp Bird	1 7 9	1 7 9
El Oro	1 7 3	1 6 9
Esperanza	3 4 6	2 8 9
Dolores	1 15 0	1 14 3
Oroville Dredging	1 1 3	1 1 10½
Stratton's Independence	0 3 9	0 3 9
Tomboy	1 9 3	1 8 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Oct. 25.	Nov. 1.
Bingham Central	2⅛	2¼
Boston Copper	32¼	32½
Calumet & Arizona	139	150
Cumberland Ely	12½	13¼
Dolores	8⅝	8⅝
El Rayo	6⅞	7⅛
Guanajuato Con	5	4⅞
Giroux Con	11	12½
Greene Con	25⅛	25
Nevada Con	22	20
Nipissing	27⅛	30¼
Tennessee Copper	46⅞	45¼
Tonopah Ex	5¾	7¼
Tonopah-Belmont	6⅝	7¼
Tonopah	21¼	21¼
United Copper	63⅛	65½
Utah Copper	36	34

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

POTASSIUM CYANIDE is used as a flux for the elimination of sulphur and oxygen, forming sulpho-cyanides and cyanates.

THE use of slag sand for locomotives is not to be recommended if grit can be obtained. The former makes a sticky film on the rails in wet weather.

MILLSITES cannot be located within forest reserves. The right to locate within such reserves is limited to *mineral lands*. Millsites can only be located on lands that are non-mineral.

THE slipping of locomotives on steep inclines may be avoided by spraying ammonia on the track in front of the drivers. While this is a most effective remedy, the cost is high and the effect is not lasting.

USUALLY the ventilation of raises by blowers is more economically accomplished by exhausting than by blowing. In certain special cases where the air at the bottom of the raise is bad, the reverse method may be found necessary.

IN sampling unparted and unfine gold bullion a dip sample should be taken; if lead, bismuth, or zinc be present, it is absolutely necessary to do this. The gold should be melted with nitre and cuprous chloride and a sample taken with a hot dipper.

THE use of powder that will not easily slide into the the drill-hole should be prohibited. The carelessness of blacksmiths in gauging machine steel will often result in undersized holes and consequent forcing of large sticks of powder into holes that are too small.

IN Colorado the cost of concentration in well equipped mills is as follows:

20 to 30 tons capacity daily,				$1.50	per	ton	of	crude	ore.
40 to 50	"	"	"	1.00	"	"	"	"	"
75 to 100	"	"	"	0.75	"	"	"	"	"
150 to 200	"	"	"	0.60	"	"	"	"	"

THE water needed in concentrating mills, including that needed for power, will average 3.5 tons per ton of ore. In badly constructed mills this may easily run up to five or even ten tons per ton of ore. If ample settling tanks are provided for the water, and it is then pumped back and again used, the amount required need be no more than one ton of water per ton of ore.

IN drilling with machines it does not pay to overload an air-compressor with too many drills, or to use a main pipe so small as to reduce the air-pressure materially. Experiments show that a drop of pressure from 75 to 45 lb. will reduce the length of hole drilled by more than 50%. Great care should be taken to have no leaks in the pipe-line, especially in the hose and couplings.

FREQUENT HANDLING of nitroglycerine causes violent headaches, especially if afterward one touches the nose or tongue with the hands. Some people soon get inured to it, but others never. As remedies, drinking cold black coffee, the application of cold wet bandages to the neck and forehead are usually efficacious. The use of acetate of morphia under proper medical supervision is also to be recommended.

THE value of an accurate survey showing the fissures and shear planes in unraveling the dynamic geology of mineral deposits cannot be over-estimated. In underground workings the strike of any fissure crossing a drift may be determined by plotting the two points at which the horizontal plane of the transit will cut the seam on each side of the drift, the dip being measured at right angles to a line oining these two points.

IN designing a mill for concentrating ores, it is important to have a sufficient fall for all the launders and for the screens, so that the stream of ore may never get blocked, and also to save the water otherwise needed to wash the ore along. Provide plenty of light, plenty of room, plenty of water, and an excess of power. With insufficient power it is impossible to keep up regular speed, stoppages and blocks become frequent, and the whole of the concentrating machinery works at a disadvantage.

THE following flux will be found to give very satisfactory results for the determination of small quantities of precious metals in cupriferous sulphides, carrying as much as 10% copper and 48% sulphur without any preliminary roasting or separation: litharge, 2,500 grams; sodium bicarbonate, 3,750; borax, 1,000; sand, 3,000; nitre, 750; some nails should also be added. A 50% copper matte (1/10 A. T.) may be fluxed in a small crucible with the following: Litharge, 60; sodium bicarbonate, 20; borax, 6; sand, 15. A borax cover should be used.

WATER RIGHTS cannot be appropriated or initiated within forest reserves without the consent of the Secretary of the Interior. The land within the reserve, except such as has been previously patented, belongs to the Government and is subject to the control of Congress. If any water privileges within the reserve are desired they must be applied for under the regulations of the Department. The latest circular on this subject was promulgated by the Department, September 28, 1905, and can be obtained by writing to the Secretary of the Interior.

IN handling broken rock and ore, the output of a man depends very largely on whether he is shoveling on a smooth surface or on the ground. Planks or iron sheets are often used, the latter being preferable, as small pieces of rock will strike into the plank and cause an obstruction. Ten cubic yards of ore in place, equivalent to 17 cu. yd. broken, should be loaded into cars within 10 hours by one man. With crushed ore and a good floor, a man working at the surface should be able to handle 20 cu. yd. of loose rock per day of nine hours.

THE absence of appreciable quantities of tellurides in the placer workings of Calaveras county, California, has often been the subject of comment. These deposits cross a number of productive veins from which tellurides are obtained in considerable quantity, notably sylvanite, petzite, and calaverite. These minerals, however, have a specific gravity of only 9 to 10 and are rather brittle. Further, their bladed or flaky nature—due to cleavage—would reduce the tendency to form placer deposits, only the rock-forming iron minerals, such as magnetite and ilmenite surviving, to be caught in the 'sands.' It is not surprising, then, that the tellurides are lost to the placer miner, since their specific gravity is only half that of gold and their cleavage and lack of ductility makes them naturally difficult of concentration. The ready decomposition of tellurides is also an important factor, for they are less stable than sulphides, and even pyrite is usually found to be oxidized, the iron of placer deposits occurring as limonite in the clay.

Discussion.

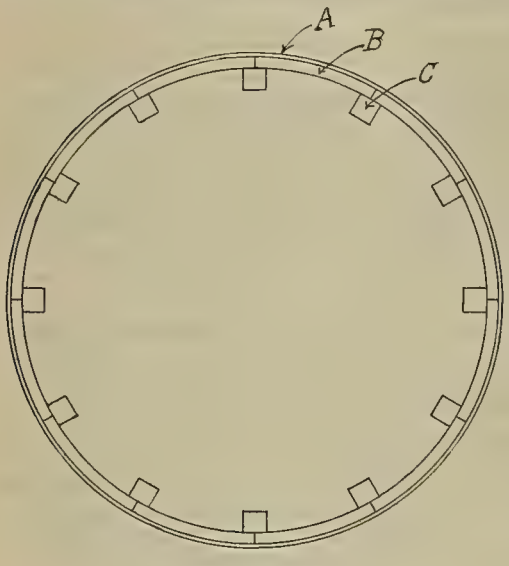
Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Tube-Mill Lining.

The Editor:

Sir — In your issue of July 28, 1906, I read with pleasure the article on 'Tube-Mill Lining,' in which the Barry honeycomb is described and illustrated.

There is no doubt that this patent is a great improvement on the silex lining which the Waihi Co. imported with their tube-mills. Anyone who has had experience with the silex lining knows how expensive and troublesome it is when used for wet grinding, and consequently will welcome any improvement in the matter of initial cost and maintenance. The ordinary iron or steel liner,



A Tube-mill Lining.

with smooth inner surface, is also unsatisfactory, for, owing to the stones sliding and thereby becoming flat, much of their efficiency for grinding is lost.

Having run tube-mills for some considerable time, grinding the sandy portion of the pulp from stamps, crushing hard ore through all grades of wire-screen from 30 mesh down to 10 mesh, and having had trouble, owing to the use of smooth iron liners, I set to work and brought out an improved iron liner, which consists of segments of a special hard mixture of iron, costing 14s. per cwt. (say, three cents per pound), when manufactured into liners. These liners are 4 ft. long and 1⅛ in. thick, and are of such a width that 12 form a circle of 4 ft. diam., which is the diameter of the tube-mill. Instead of having holes cast for bolts, they have only two half holes on each long edge. Over the junction of each pair, a cast-iron bar 2½ in. square is placed and bolted by two square-headed bolts through the lining and outer shell of the tube-mill. Thus there are 12 cast-iron bars which run longitudinally through the mill, and the effect is to form a casing of flint stones which does not slip and which protects the iron lining.

Such liners have been used for some time in the mill of the Komato Reefs Co., New Zealand, and have lasted for 18 months before being renewed. Without the square bars, the smooth iron liners only last six to eight months.

The cost of liners and bars for a 4 by 16 ft. tube-mill is £84, and two men can fix them all in position in three shifts of eight hours each; the total cost with bolts would be, say, £90. The amount of sand passing through the tube-mill is 70 tons per day of the material discharged through the 10-mesh screen of the stamp-battery, and the finished product has the fineness that would be secured by the use of a 35-mesh screen on the battery. Thus the cost of lining is about seven-tenths of a penny, or 1.4 c. per ton of sand ground.

S. D. MCMIKEN.

Komata, New Zealand, September 2.

The Position of Amalgamating Plates.

The Editor:

Sir—The article by Percy Morgan, in your issue of September 29, on 'The Position of Amalgamating Plates in the Stamp-Mill' is as full of common-sense ideas as an egg is full of meat. Although I have never seen plates so arranged, I know from my own experience that such a plan should be as near perfection as possible. I wish to add a suggestion for a further improvement, namely: Set the plates so that the pulp will flow across them sidewise instead of lengthwise, as is the usual custom. This will allow the pulp to be distributed more thinly on the plate and with the addition of a spray of clear water at the upper side, or head of the plate, with proper grade, and with plates kept in the proper condition, there will be very little, if any, amalgam that will get farther from the head than three or four feet. So I think that four to six feet would be an ample width of plate—said width to be determined by the character of the ore. If the ore is 'free-milling' and contains heavy gold easily amalgamable, then any arrangement will do, if the plates are properly attended to; but it is in cases where the ore is low grade, and where the amalgam is light and hard to hold on account of much silver, or lightness and fineness of the gold, that this side distribution of the pulp upon the plates would prove the most advantageous. If the ore is low grade, the duty per stamp per 24 hours is usually from four to six tons, and this makes too great a load for the plates as usually arranged, and the tons of water and sand passing over them scours and wears off the amalgam almost as fast as it is deposited.

J. R. SEARS.

Sutro, Nev., October 10.

Copper in Cyanide Solutions.

The Editor:

Sir—I note what C. A. Arents says about copper precipitating on zinc shaving, and, having had a similar experience, I can agree with him that copper may not be a hindrance to good precipitation.

Two years ago I was operating a cyanide plant in the desert country, treating a dump of old pan-mill tailing. One mill had burned down there, and there were numerous small pieces of burned copper plate mixed with the sand. The copper did not begin to show until the plant had been running about four months. The concentration of copper in the solution was probably due to the fact that no wash-water or weak solution left the plant except that existing in the residues as moisture.

Copper began to show first on the fresh zinc that was put in the lower boxes and in a month or six weeks it had worked up to the head boxes. I was somewhat alarmed at first, and tried to keep it off by adding cyanide to the filter-box. The stronger solution would take it off in a few hours but only to be back again the next morning. I took daily samples (for a while) of the solution leaving the boxes, but they only assayed a trace to a few cents, when the solution entering averaged about five dollars per ton.

The gold seemed to precipitate on the copper-covered

shaving so that there were shades from bright copper, bronze, to black. There was also mercury in the sand which was taken up by the solution and precipitated, causing some of the shaving to look like silver.

The value of the precipitate shipped was about $16 per lb. before the copper began to show, and gradually it decreased to about $8 per lb. But with the exception of making a lower grade precipitate, the copper did no harm whatever, and the precipitation was as good after as before.

E. D. CHANDLER.

Rochford, S. D., October 17.

[Referring to the useful contribution from Mr. C. A. Arents, we are informed by him that 0.75% copper per ton should have read 0.75 lb. copper per ton of ore.—EDITOR.]

Gold Dredging.

The Editor:

Sir—In the issue of your paper of January 27, 1906, under the heading of 'Gold Dredging,' J. H. Curle asks seven specific questions, and the article goes on to give a great deal of valuable information which, on two points, I venture to think, is a little misleading. In referring to the Yuba district, Mr. Curle states that a large area of gravel 90 ft. deep gives good returns, and that the dredges there are to work to that depth. Though the drilling in the Yuba field discloses the fact that gold values are contained at least to a depth of 115 ft., it has only been considered advisable to build boats fitted to dig at their greatest advantage, to depths not over 70 feet.

This article was published in January, 1906, and at the present date there are ten dredges at work. All of these are equipped to dig to 64 ft. below water line, and the deepest work that is, or has been, done there is at a depth of 72 ft. below water line. Under the conditions prevailing on the Yuba the water line is, as a rule, only a few feet below the actual surface—in some cases, indeed, the dredging ponds have to be kept pumped out so that the surface of the dredging ground may be above water and in order that the digging ladder may reach the depth mentioned. This, so far as I am aware, is the greatest depth to which dredging has been carried in any part of the world, but as the best values in dredging lands in the majority of cases lie close to the bottom of the digging it is not hard to see that an overburden, if commercially unproductive, simply tends to reduce the profit—or, in other words, to lower the average grade per yard of the material which it is necessary to handle.

The other point to which exception may be taken is contained in the concluding sentences where it is inferred that Oroville and the Yuba districts should be studied as the most modern examples of up-to-date prospecting, designing, and dredging. The name of Folsom is only conspicuous by its absence. In my humble opinion this district should rank at least with the others for all and more of the qualifications mentioned. It is not only the most important as having the largest available area of dredging ground; but (in some cases under unique conditions) illustrates the handling of the largest yardage per boat of any locality in the world, and—as far as can be learned—at as low an average cost per yard.

I have recently completed an extensive examination of the dredging fields of Oroville, Yuba, and Folsom in the Sacramento valley, and have investigated fully most of the points embodied in Mr. Curle's seven specific questions. Those questions were:

1. How many payable or probably payable dredging areas are known in the world, and what is approximately their gross extent? Which are the likeliest countries to prospect?

2. How much gold is produced yearly by dredges and how much of the production is profit?

3. How many dredges are now working at a profit?

4. How many dredges that were once worked are not now worked, and what were the reasons for their stoppage? How much money do these represent?

5. What are the precise costs in different localities? How are costs affected by: *a*. Type of dredge; *b*. nature of deposit; *c*. nature of power; and *d*. climate?

6. What is the best system of prospecting dredging ground? How should such system be adapted to different kinds of ground? Is drilling as effective as sinking shafts or paddocks? What is the average recovery of the gold contents as shown in prospecting? Why are favorable results in prospecting often falsified in practice?

7. Assuming prospected or otherwise proved ground to represent 'ore blocked out,' which is the correst basis of valuation for such ground?

As the results of my investigations are shortly to appear in print, I shall simply refer to Mr. Curle's queries in a brief manner.

No. 1 does not apply to this locality.

No. 2. This is a difficult question to answer accurately in detail, because the information is not fully obtainable. However, assuming that at Oroville, the average total working cost is seven cents per yard, the average recoverable value of the gravel 14c., and the annual yardage produced about 19,200,000; then there is a total annual production of $2,688,000, of which $1,344,000 is net profit. On the Yuba the annual yardage is from 9,600,000 to 10,200,000. The recoverable value of the gravel has been estimated at 20c. per yd., then assuming that the working cost is 5.5c. per yd., the total annual production is $2,000,000, and the profit $1,450,000.

At Folsom figures of this sort are difficult to obtain, but the average value over the whole tract is probably not over 11c., though in places it will run much higher than this figure. Taking the average working cost as 5c. per cu. yd., and the total annual product as 8,500,000 cu. yd., the profit is estimated at $510,000.

Therefore in the three districts an approximate estimate of the total annual production, the average recovery per yard, the average cost of working per yard, and the total annual net profit may be summarily expressed in tabular form as follows:

District.	Annual operations in cu. yd.	Production.....	Recovery per cu. yd. in cents	Cost per cu. yd. in cents.....	Annual profit.
Oroville	19,200,000	$2,688,000	14	7	$1,344,000
Yuba	9,600,000	2,000,000	20	5.5	1,450,000
Folsom	8,500,000	935,000	11	5	510,000
Total	37,300,000	$5,623,000	.....	.....	$3,204,000

No. 3. In the three districts there are 49 dredges in operation, of which, say 41, have been working over nine months. Of the latter number probably over 90% are working at a profit, while undoubtedly all of the remaining eight will pay dividends.

No. 4. Only two dredges that are not now working are still fit for operation, all the others having, through service, become mechanically unfit for use. Of these two, one is of too small capacity and is practically worn out, while the other is also of ancient design, but could be remodeled and used. After litigation it was sold at sheriff's sale. The property on which it operated is still commercially valuable from a dredging point of view. The two dredges probably originally represented about $95,000.

No. 5. The costs have been given in the answer to question No. 2.

a. The type of dredge affects the cost of production chiefly as regards its digging capacity, this being favorable in proportion to the increase in size of buckets up to at least 7½ cu. ft., and probably up to 13 cu. ft., where proper repair facilities are available and several machines are operated under one management. Fixed costs are reduced in the larger machines and output is increased.

b. The nature of the deposits affects the cost as follows: Hard ground and large boulders require more power and there is greater loss of time, one of the main factors in increasing cost. Moreover, the cost in labor and repair of parts is increased.

Clayey ground requires more disintegration and causes loss of gold over the stacker.

c. Electric power is the only form used in the districts of Oroville, Yuba, and Folsom, and is undoubtedly superior to steam, not only as affects reduction of cost, but on account of its advantageous application and control.

d. Climate practically does not enter into consideration in this region except as regards high or low water in the flood season. Even then it does not affect the cost to any degree.

No. 6. Undoubtedly the most effective practical system of prospecting dredging ground is by shaft. Drilling costs on the average $2.50 per ft., and is often very unsatisfactory in results, both as regards information on values and nature of ground. In comparison with the drill as a method of sampling, a shaft is more thorough and costs less per foot above water-level; even below water-level, where pumping is necessary, it is to be recommended, as it can be referred to afterward in ascertaining the exact nature of the ground. The cost of shaft sinking by the 'China' method varies between 90c. and $1.50 to water-level, and the increase below this point varies with the amount of water. These figures include cost of panning.

The ratio between estimated value of ground by drilling, and actual recovery by the dredge, is not a fixed proportion, but may generally be said to increase in constancy over a large area roughly in proportion to the number of holes per acre. Single holes are rarely indicative of the value of adjacent ground, though a somewhat arbitrary rule that seems to apply in practice, is: Where a hole gives excessively high results the recovery by dredge at that spot is usually lower, and vice versa.

The care with which the computation of the value of a dredging property from bore-holes is made should be in exact proportion to that taken in computing, by bank measurement (after clean-up), the cubic content dredged. The results are often vitiated by old workings, clay, etc., encountered by the drill.

No. 7. The method of valuing prospected area may be generally compared to that of valuing a mine from sampling and assaying, except that in the former case the results are not so consistent or accurate. One authority of a very wide experience states that before deducting from the 'prospected' value of a property, the cost of working, interest, depreciation, etc., he reduces the estimated value as obtained from drilling by 40%. As I have already taken considerable of your valuable space, I shall refer to the question of sectionalizing a dredge in another issue.

In the criticism of Mr. Curle's article by C. W. Purington, appearing in your issue of July 28, there are also several points touched upon which, in my opinion, may be themselves criticized. The generalization that "flood plains reduced nearly to base level, in which streams meander are * * * the first requisite for gravels fit for dredging" is disproved by the conditions in the Sacramento valley. Neither the territory on the Yuba where the river bottom, with its accumulation of tailing overburden, forms the gold-bearing material, and the bench gravels of the American river at Folsom, together forming probably half (in value) of the available fields, come under this head.

The large dredging area adjacent to the American river, near Folsom, seems to be almost ignored by both Mr. Curle and Mr. Purington, though undoubtedly excellent and remunerative work is being done there today.

Referring to Mr. Purington's criticism of question No. 4, I do not understand Mr. Curle's question to refer to every dredge that has *ever been built*, as naturally a dredge's life is only that of the hull, and under early conditions this was not very long lived. As far as his remarks refer to the districts of Oroville, Yuba, and Folsom, they seem rather extravagant.

Mr. Purington states that probably not over 100 dredges are working at a profit in the world. As there are probably 48 working at a profit in California, and I am credibly informed of at least four others in the United States, the New Zealand practice, where there are over 200 in use, must be a losing business.

Contrary to the opinion expressed, I contend that shaft sinking is feasible in the large majority of cases, and is much cheaper than drilling. Even where water is encountered the cost in 90% of cases is not increased in undue proportion to results. The question of valuation is one that Mr. Purington covers considerable space in treating, but the sum of his remarks seem to be that "to enquirers like Mr. Curle," at least, no proper system of valuing the ground to show net profits has been discovered. I confess that I cannot see any particular difficulty in computing the purchaseable value (which, by the way, is the real test), of a properly examined and prospected dredging area other than those that occur in mine valuation. The increased risk incurred in prospecting dredging ground is offset by the possibility of change in the nature of orebodies with depth, and of necessitating different and more expensive treatment at surface. No competent engineer would value any property, either dredging or lode, without making similar and proper allowances for all expenses, including preliminary and amortization, etc., and therefore I do not see why exceptional stress should be laid on those points when applied to dredging.

D'ARCY WEATHERBE.

Bisbee, October 22.

How Nuggets May be Made.

The Editor:

Sir.—Mr. Charles S. Palmer, in your issue of September 30, outlines very instructively the laborious methods of nature in making nuggets. That method may be good enough for the 'highly trained' engineer. I have, however, a much simpler method, without any college frills on it. Take molten metal; pour from a spoon drop by drop into a vessel filled with wheat; take the nuggets thus formed and boil them in coffee. If worn in strings across the breast they form a splendid insignia for us real mining experts.

PROMOTORS G. HELPER M. E. (not E. M.)

London, October 10.

GEOLOGY is, as it were, the biology of our planet as a whole. In so far as it comprises the surface configuration and the inner structure of the earth, it answers to morphology; in so far as it studies changes of condition and their causes, it corresponds with physiology; in so far as it deals with the causes which have affected the progress of the earth from its earliest to its present state, it forms part of the general doctrine of evolution.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

In an action by the lessee of a mine against the lessor for damages for eviction and for the value of ore taken, and where the veins included within the description were in dispute, and the lessor failed to produce his office map, referred to in the description, the court held that such failure to produce the map, warranted the presumption that the map would show that the lessees' contention was correct.

Isabella Gold Min. Co. *v.* Glenn, (Colo.), 86 Pac., 349.

Where the lease of a mine granted the lessee the right to extract ore from all veins outcropping "within and belonging to the southeasterly five hundred feet of a certain lode mining claim" the court held that the lessee was entitled to all outcropping veins and all others which for any reason belonged to the five hundred feet described, and was not limited to veins which both belonged to and had their apices in the claim described.

Isabella Gold Min. Co. *v.* Glenn, (Colo,), 86 Pac., 349.

Where it was shown that the lessor of a mine evicted the lessee and extracted large quantities of ore, it was held that under such circumstances the burden of proof was upon the lessor to prove the amount and value of the ore taken by such lessor and any subsequent lessee.

Isabella Gold Min. Co. *v.* Glenn, (Colo.). 85 Pac., 349.

It is the duty of the owner of a mine to notify the miners of an unexploded charge of giant powder, and the delegation of this duty to a foreman will not relieve the owner in case of injury, in case the foreman fails to give such notice.

Bone *v.* Ophir Silver Mining Co. (Cal.), 86 Pac. 685.

A purchaser agreed to pay seven thousand one hundred dollars for a certain mining claim, and one hundred dollars cash was paid and the remainder to be paid at a certain future date. The balance of the purchase price was deposited in bank with instructions to pay the same to the seller on presentation of a receipt of the receiver. It was held that the bank was justified in paying the money on presentation of the receiver's receipt.

Hunt *v.* Capital State Bank (Idaho), 86 Pac. 706.

Under a contract to pay a certain price per ton for ore deposited in the chutes ready for hoisting, payments to be made on certain days of each month, for the coal hoisted, it was held that the plaintiff could recover for coal deposited in the chutes, though it was not hoisted because of water rising in the mine.

Ward *v.* Eastwood (Cal.), 86 Pac. 742.

Where the purchaser of a mine agreed to pay the cost of procuring a patent to a mining claim, and the seller proceeded to and procured the patent, the purchaser was held liable for the cost of such patent.

Hunt *v.* Capital State Bank (Idaho), 86 Pac. 786.

Engines, boilers, pumpers, coal and water cars, rails, tippers, screen bars, tools, and implements used together in connection with the operation of a coal mine, constitute improvements and are consequently assessable as real estate, and such property cannot be sold to satisfy a personal property tax.

Doe *v.* Tenino Coal & Iron Co. (Wash.), 86 Pac. 938.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rocks from Jerome, Ariz., marked A. G., are: No. 1. Obsidian pebbles; No. 2. Rhyolite-tuff.

The mineral from F. H. B., of Melbourne, Australia, is ilmenite, the oxide of iron and titanium.

The specimens from A. B. H., of Cima, Cal., are quartz and chlorite containing plates and grains of specular hematite.

The specimens from Iron Springs, Idaho, marked T. D. and X. T. D., are quartz containing veins of talc and graphite.

The specimen from Alleghany, Cal., marked T. H. B., is talc-schist and is often associated with serpentine or chlorite-schist as country rock.

The rocks from C. F. G., of Sisson, Cal., are: No. 1. Compact dark green chlorite; No. 2. Quartzite; No. 3. Serpentine containing pyrrhotite.

The rocks from H. P. A., of San Antonio, Tex., are: No. 1. White quartz; No. 2. Basalt; No. 3. Amygdaloidal basalt with calcite in the cavities.

The rocks from J. H. P., of Homestead, Ore., are: No. 1. Serpentinized rock containing chalcopyrite and pyrite; No. 2. Hornstone; No. 3. Bornite in jasper; No. 4. Mixture of jasper and serpentine.

Specimens from W. W. R., of Stewart, B. C., are: No. 1. Siliceous limestone; No. 2. Quartz mixed with chlorite; No. 3 and 4. Pyrite and pyrrhotite altered to limonite; No. 5. Carbonaceous rock.

The specimens from E. R. Mc., of Reno, Nev., are rocks decomposed into clay, micaceous chlorite, and brown limonite. Much pyrite or pyrrhotite was present which has been altered to limonite, but no nickel is present in the samples.

A BIT OF CORNISH FUN.—The manager of a gold mine sent an imperative demand to a shareholder for the payment of a 'call' and received this reply:

"Dear Sir.—I have your letter of this date and note that your directors propose to proceed against me. Your prospectus stated that one of the objects of your company was to 'seek, win and work gold in——and elsewhere.' Things not turning out well in——your directors apparently consider it their duty to seek, win, and work gold elsewhere, i. e., out of me. I can assure you, however, that I am not in an auriferous vein; the only lode I possess is a load of debt, and as a gold mine I shall be a failure. Your prospectus estimates a yield of 1 oz. of gold per ton on 30,000 tons of quartz crushed per annum. You may 'crush' me, but you will find that I will not yield nearly so much. My person (which for the purpose of this calculation may be considered quartz), weight, roughly speaking, 10st., and if crushed immediately I estimate that it would yield as under: Gold, nil; silver, 3s.; copper, 4½d.—total, 3s. 4½d. Deduct cost of crushing, say £5 5s.—Yours faithfully——."

THE development of every branch of physical knowledge presents three stages, which, in their relation, are successive: observation, experiment, and speculation.

Three Weeks in Mexico.---IX.

Pachuca—Its Early History.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Pachuca is approached from Mexico City over a railroad that traverses the wide volcanic plains, through vast plantations of *maguey* whose serried lines stretch out like an army in skirmishing order. A journey of 62 miles brings the traveler to a white town at the foot of brown hills that rise to a range 1,500 ft. above the valley, which is 8,200 ft. above sea-level. The morning I saw them first, the mists still hid their summits and gave them the possibility of a greater height. Pachuca is like far-away Kalgoorlie in the matter of dust, it swirls round every street corner and smothers the picturesque in the dry folds of the commonplace. In the plaza, among the graceful pepper trees, there are two eucalyptus, fifteen to twenty years old, whose dark blue foliage and ragged columns told of a land which was unknown to the civilized world for 250 years after the Spaniard invaded Mexico. The antiseptic odor of these gum trees recalled to me many a glorious day spent in the Australian Alps.* But Pachuca differs from any modern mining town in English-speaking countries in every respect except its dust, and even that has a composition all its own. The corrugated shanties and the white tents of ephemeral mining camps are here replaced by a solidity of construction that bespeaks a hereditary occupation. Massive stone buildings overlook the narrow cobble-paved streets and some of them have architectural pretensions, as for example the offices of the Real del Monte Mining Co., an enterprise of historic continuity and associated with names famous in mining, for John Taylor & Sons were engineers of the old company sixty years ago. Even to this day John Taylor's name is honored, and in the Santa Brigeda mine there is a level that continues to be called the *canyon de Taylor*. Another reminder of the Cornish invasion is seen in the fine stone mansion, half smothered in beautiful *bougainvillea*, of Mr. Francis Rule, whom his countrymen call Capt. Frank Rule, and the Mexicans, Don Pancho, an honored and successful mining engineer.

Pachuca has a population of 40,000, and of this number 7,000 work underground. The district produces 6,000,000 oz. silver per annum and 30,000 oz. gold, representing 9,000,000 pesos or $4,500,000.

Most of the lodes that are productive today were discovered by the *conquistadores* and their immediate (Spanish) successors, aided, to some extent, by the natives (Aztecs). The Spanish pioneers sought for gold placers and extracted the metal—not much—that they found, by washing, supplemented sometimes by amalgamation. What silver ore they encountered, they smelted with carbonate of soda (the *tequesquite* of the Spaniard and the earlier *tequixquitl* of the Aztec), a supply of which came from the lagoons in the valley—for instance, in the lake of Tezcoco. Their fuel was charcoal made from fir and oak; possibly also they used some lead ore to collect the silver in their rudimentary smelting operation. When Bartholomé de Medina invented the *patio* process at the Hacienda Purisima Grande he revolutionized the silver mining industry. This was in 1557; up to that time only the richest mineral could be smelted and there was no process for treating the low-grade ore. Medina was the first to apply amalgamation to silver, despite its much earlier application in gold mining. This was a basic improvement, but he also elaborated the method for treating silver sulphides by chloridizing with salt in the presence of copper sulphate, using mules to mix the charge. This is the *patio* process, so called because it takes place in an inner court or yard (the *patio*) and from Medina's day to this, for 350 years, it has been the characteristic feature of Mexican metallurgy.



Sketch Map of Mexico.

In 1739 Pedro José Romero de Terreros, who had made money by mining in Queretaro, visited Pachuca and became impressed with the Real del Monte district. He spent his capital, said to have been $60,000, and borrowed more to carry out his explorations, but finally he

*The pepper trees which ornament Pachuca also came from a far country; they are called the Peruvian tree, having been introduced by one of the last of the Spanish viceroys, who brought them from Peru, where he had previously held office. The eucalyptus was introduced thirty years ago by the minister *de fomento*, but it has not done very well, the soil being too dry.

struck a bonanza and won a big fortune. He gave the king of Spain a battleship and other large gifts; in consequence, he was ennobled. As Count of Regla he became the founder of a family of successful miners. They worked the mines until 1819, when the disorderly condition of the country, due to the revolution against the Spanish Government, caused operations to cease. A few years later the mines were sold to an English company, which took charge in 1824. The doings of that company are still mentioned in every Mexican guide-book, the writers of which dwell with gusto on their wild speculation in London and their reckless extravagance in Mexico. The £100 shares rose to £16,000 apiece, almost before a start had been made; enormous sums were spent at the mines, no less than 1,500 tons of machinery being hauled across the country from Vera Cruz. In 1848 the company went into liquidation, after extracting $16,000,000 in silver and spending $20,000,000. In 1850 a Mexican company was organized, and it is this ownership that survives without

closed by massive walls, which at one time served as protection from assault, but nowadays they are retained for a different reason. They safeguard the dumps, which are recognized as having a possible value in the future, for the *peones* are born thieves and their pilfering is a constant nuisance to the mining companies. For this reason also the reduction works, or *haciendas*, are all enclosed within lofty walls, which are entered by arched doorways at which a watchman stands. At noon the women crowd at these entrance gates with baskets containing the dinner of their men, who meet them there; they often squat down beside the wall to have a chat and share a smoke, until the lengthening shadow marks the time to resume labor.

All the *peon* employees of the mines and mills are rigorously searched by the *velador* as they pass out through the gate of the enclosing wall. The ordinary *peon* laborers are cheap enough, but it is what they steal that makes them costly. They are inveterate thieves.



Pachuca. *Patio Mills in Foreground.*

important change to the present day.† The first manager of the Mexican company was the last manager of its English predecessor; that was John Buchan, obviously a Scotchman; and despite the change of ownership there was a continuity of management, the Spanish and the British members of the staff co-operating loyally. During the Maximilian days and the later successive fights for the presidency, the mines at Pachuca suffered from the depredations of the military, partly soldiers but mostly bandits. Stories are told of the miners having to live underground for days at a time and of the money that was buried in the levels when people at surface were being robbed without compunction. Up to 1890 it was necessary to carry a revolver in the streets of Pachuca, even in the daytime. The Real del Monte office, for example, is a massive stone structure which originally did duty as a fortress; the round towers, slotted for rifle fire against attacking forces, still stand at each of the four corners of the building. Every mine even today is en-

All sorts of precautions are taken. At the Hacienda Loreto, the manager proposes to make his men pass through a water tank and compel them to shout "*Viva Mexico*" three times in order to detect any amalgam that they may have in their mouth. And they have other schemes for overcoming their excessive poverty otherwise than by earning scanty wages. For instance, there is a great deal of mutilated coinage and also of counterfeits. When pay-day arrives, the workmen, in sweeping their silver across the office-counter, will try to palm off spurious coins by claiming that the cashier gave it to them. The trick is detected by the warmth of the coin which the man has held in his hand just before passing it in. Punishment for this trick is severe, as it is an offence against the Federal Government; several years in jail is not uncommon.

At Pachuca the application of mechanical invention to a basic industry is amusingly illustrated by the fact that even *tortillas*—the common pancake of the country—are made by machinery. The people of Pachuca patronize the establishment where this is done because the cost is

†Since this was written the Real del Monte mines have been sold to a Boston corporation. The Anglo-Celtic invasion has begun!

one half that of the hand-made article and they are equally palatable. The excellence of the local *tortilla* may explain the vigor of the native miner; for the *barateros* of Pachuca are recognized to be the best miners in Mexico; they have learnt from the Cornish who settled in the district more than fifty years ago and intermarried with the natives. The Guanajuatenses, or men from Guanajuato, have the reputation of being quarrelsome and less efficient as miners,—which may be for lack of admixture with a strain of Cousin Jack, but we do not make the suggestion with any confidence.

The natives of this district, like most Mexicans, are wonderfully clever in estimating the silver content of an ore within their own stamping ground; stolen ore is invariably bought by valuation at sight. Even the tributers (those that work on tribute or *partido*) sell the ore they mine to the proprietary company on the basis of an estimate of its assay-value made at sight by an official termed the *rescatador;* if the appraisal is not satisfactory, they can sell their ore elsewhere. Tributers get an eighth of the stuff they mine—that is, one sack in every eight—the remainder going to the company. This is the system at the Real del Monte mines; other companies work chiefly on contract.

We, that is Robert M. Raymond of El Oro and the writer, made an interesting visit from Pachuca to the neighboring mining town of Real del Monte; this courtesy, and much information, we owed to Señor Don Carlos de Landero, the managing director and one of the most accomplished of Mexican mining engineers. In a large carriage drawn by four mules, with a driver and footman dressed in the picturesque uniform of the company, to the crackling of the whip and the heavy rumbling of the wagon over the cobblestones of Pachuca, we started on the morning of October 30, before the mists had uncovered the crests of the range where lies the treasure unexhausted despite the mining of three and a half centuries. Emerging from the narrow streets, the road cuts the edge of the valley and winds slowly among the brown hills, dotted with wild *maguey*. At the San Francisco shaft of the Santa Gertrudis company we saw a large pumping engine of the Cornish type, built by Bickle & Co., of Plymouth, in 1898. The cylinder is upright and 90 in. in diameter; the stroke is 9 ft. and the pump-column 18 in. The capacity is 3½ cu. m. or 1,000 gal. per min., from a depth of 400 metres. This pump was chosen by Capt. Frank Rule under a former administration; it was obtained at an enormous cost on account of the difficulties of transport and erection. Although made in 1898, it was not at work until 1902. But once erected, the pump has proved most efficient. The boilers are single-flue with two fire-places and nine Galloway tubes, so as to be well adapted to the use of the mine water.

The distance from Pachuca to Real del Monte is six to eight miles, by the various roads. Haulage of ore costs three *pesos* per ton, the road crossing the summit of the range, 1,100 ft. above Pachuca. Only one trip per day is made.

Nearing the divide, the road crosses the red outcrop of the Vizcaiña lode, famous in local mining annals as that which gave such wealth to the first Count of Regla. The story is worthy of repetition, although it has several versions, the most reasonable of which is here offered. In 1739, Pedro Terreros, who is said to have made $60,000 in the mines of Queretaro, happened to visit Pachuca. He was an experienced miner. Becoming interested, he abandoned the journey to Spain, and started mining at Real del Monte. Humboldt speaks of "the vein of la Biscaina or Real del Monte;" it is now spelt Vizcaiña (pronunciation remaining unaltered, but the Mexican orthography being substituted) and it is evident that the name was given after Terreros came there, for it refers to the country of his nativity, Biscay—most sea-goers know the Bay of Biscay. Terreros was successful, but the increased flow of water compelled him to abandon the main Santa Brigeda workings when they were 120 m. deep. In the early part of the eighteenth century the water in mines was hoisted by methods which still survive, namely, hide bags and a windlass. Even in Humboldt's day, sixty years later, much the same practice obtained. He says: "A bag full of water suspended to the drum of a *barritel* with eight horses (*malacate doble* or double horse-whims) weighs 1,250 lb.; it is made of two hides sewed together. The *malacate doble* has four arms, the extremity of each arm has a shaft (*timon*) to which two horses are yoked. The diameter of the circle traveled by the horses is seventeen *varas* and a half (that is, 47½ ft.); the diameter of the drum is twelve (32 ft.). The horses are changed every four hours."

However, the influx of water was finally overcome in miner-like fashion by driving a drainage adit (*socabon*) into the hillside. Humboldt says: "A very enterprising individual, Don Joseph Alexander Bustamente, was courageous enough to undertake a level near Moran; but he died before completing this great work, which is 2,352 metres in length from its mouth to the point where it crosses the Biscaina vein. * * * The level was only finished in 1762 by Don Pedro Terreros, the partner of Bustamente. * * * The level of Moran traverses the Biscaina vein in the pit of San Ramon at a depth of 210 metres." But these worthy miners were plain 'José' and 'Pedro' until long afterward, when their wealth and public spirit led to their ennoblement. This adit of over a mile long was started in 1850 and was finished in twelve years; the smaller veins intersected during the progress of the work furnished funds for its continuation, but before it was completed the projectors of the enterprise were—as is usual in mining romance—down to their last penny. When the vein was cut below the Santa Brigeda shaft, the adit was in bonanza. This was at 210 metres below surface. The orebody was worked for twelve years and the money secured by Terreros enabled him not only to equip the old mine but to buy large plantations in the vicinity. He became enormously wealthy; "this muleteer and illiterate shop-keeper," so says the chronicle, became Count of Regla. When his children were baptized the procession walked on bars of silver. Furthermore, he loaned money to his sovereign —this was one of the privileges of rich men in those days; nowadays they buy yachts and sandbag their fellow Croesus. Humboldt says that Terreros "known by the title of Count of Regla, as one of the richest men of his age, had in 1774 already drawn a net profit of more than 25 millions of *livres turnois* ($5,208,750) from the Biscaina mine. Besides the two ships of war that he presented to King Charles the Third, one of them of 120 guns, he lent five millions of francs (1,041,750) to the court of Madrid, which has never yet been repaid him."

PURE COPPER cannot be cast in sand without considerable difficulty; in fact, some deoxidizer is always used. For common copper castings from 2 to 5% zinc is generally added to get sound castings; but for electrical work this is useless. The only way to get good electrical castings is to melt pure electrolytic copper in a plumbago crucible under a thick layer of charcoal. When thoroughly melted add 2% silcon copper and stir it in with a stick, and cast as soon as ready. Practical experience alone will show the correct temperature for casting copper in sand molds, and the proper temper of the sand. It must not be cast boiling, but a fairly high temperature is necessary.

Mineral Output of California.

The State Mineralogist, Mr. Lewis E. Aubury, has issued from the State Mining Bureau a tabulated sheet showing the output in amount and value of the mineral products of California, for the year 1905. This appears somewhat later than usual as the records of many companies were destroyed in the great fire and it took a longer time to get corrected addresses and obtain the desired information.

The following table shows the yield and value of mineral substances of California for the year 1905, as per returns received at the State Mining Bureau, San Francisco, in answer to inquiries sent to producers:

	Quantity.	Value.
Asbestos	112 tons	$ 2,625
Asphalt	40,304 "	285,290
Bituminous rock	24,753 "	60,436
Borax	46,334 "	1,019,158
Brick	286,618 M	2,273,786
Cement	1,265,553 bbl.	1,791,916
Chrome	40 tons	600
Clay	133,805 "	130,146
Coal	46,500 "	144,500
Copper	16,997,489 lb.	2,650,605
Fuller's earth	1,344 tons	38,000
Gems		148,500
Glass sand	9,257 tons	8,121
Gold		19,197,043
Granite	228,738 cu. ft.	353,837
Gypsum	12,850 tons	54,500
Infusorial earth	3,000 "	15,000
Lead	533,680 lb.	25,083
Lime	616,995 bbl.	555,322
Limestone	192,749 tons	323,325
Lithia-Mica	25 "	276
Macadam	1,440,455 "	942,503
Magnesite	3,933 "	16,221
Marble	73,303 cu. ft.	129,450
Mineral paint	754 tons	4,025
Mineral water	2,194,150 gal.	538,700
Natural gas	148,345 M. cu. ft.	102,479
Paving blocks	3,408 M.	134,347
Petroleum	34,275,701 bbl.	9,007,820
Platinum	200 oz.	3,320
Pyrite	15,503 tons	63,958
Quicksilver	24,655 flasks	886,081
Rubble	1,183,802 tons	774,267
Salt	77,118 "	141,925
Sandstone	302,813 cu. ft.	483,268
Silver		678,494
Slate	4,000 squares	40,000
Soapstone	300 tons	3,000
Soda	15,000 "	22,500
Tungsten	52 "	18,800
Total value		$43,069,227

The total yield of metallic substances, including gold and silver, was, for the year, $23,523,984 and in these are also copper, quicksilver, chrome, lead, pyrite, platinum, and tungsten. This is the first year the last substance has been produced in California.

The value of non-metallic substances was $2,145,930 including borax, salt, soda, mineral waters, asbestos, coal, Fuller's earth, gypsum, infusorial earth, lithia-mica, magnesite, mineral paint, and gems.

The total value of hydrocarbons and natural gas was $9,456,025. The hydrocarbons include asphalt, bituminous rock, natural gas, and petroleum. In 1904 the product of petroleum in the State was 29,736,003 bbl., worth $8,317,809. The increase in output for the year is thus shown to be 4,539,698 bbl. and in value $690,011.

In structural materials, the total value for the year was $7,943,288, an increase over 1904 of $668,442. These materials include lime and limestone, macadam, glass, sand, marble, granite, sandstone, paving blocks, rubble, slate, soapstone, brick and pottery clays, and cement. In the last substance the increase in the output for the year amounted to 296,015 bbl., the number made in 1905 being 1,265,553 barrels.

The relative value of the principal mineral substances of the State, as shown by the tables, is as follows: 1, gold; 2, petroleum; 3, copper; 4, cement; 5, borax; 6, macadam; 7, quicksilver; 8, rubble.

While gold is still the leading mining product, its yield no longer puts the greatest gold-producing county in the first place. The petroleum of Kern county and the copper of Shasta give them precedence. Gold is more widely distributed than any other substance thus far mined in California; 34 counties out of the 57 in the State showing a gold yield in 1905, and it is known to exist in several others. Nevada county produces more gold than any other in the State, its output for 1905 having been $3,179,715 gold alone. Butte county, with its numerous dredgers, comes next. Kern county is now the largest mineral producer in the State; its output of ten substances bringing its total value last year up to $4,912,095. Its petroleum alone was valued at $3,174,966, which was not quite up to the Nevada county gold. Shasta county falls into third place for last year, instead of being first as it has been for several years, its copper production having fallen off materially, mainly on account of the cessation of smelting operations at Keswick by the Mountain Copper Co. Shasta's entire output for all minerals last year was $2,579,014.

The following shows the output of the respective counties for 1905, as arranged by the State Mineralogist. He explains, however, that certain substances have to be placed in the 'unapportioned' column so as to conceal the identity of single mines in certain counties. For this reason it is necessary to put under this heading, borax, soda, coal, portland cement, and a few other substances formerly credited to certain counties. If credited to the exact county, where there is only a single operator, private business would be made public. Under these circumstances, the figures of values of output in some counties do not actually represent their relative rank, as some of the products may be placed under 'unapportioned.' The total values of such substances appears in the main table, but not in the table of counties. Out of 57 counties of the State, 54 made some mineral production in 1905:

County.	Production.	County.	Production.
Alameda	$ 662,687	Plumas	$ 284,497
Alpine	575	Riverside	558,369
Amador	2,490,755	Sacramento	881,852
Butte	2,621,104	San Benito	360,145
Calaveras	2,415,627	San Diego	231,945
Colusa	289,454	San Bernardino	820,026
Contra Costa	197,493	San Francisco	456,042
Del Norte	10,612	San Joaquin	146,915
El Dorado	467,566	San Luis Obispo	189,592
Fresno	2,734,164	San Mateo	203,936
Humboldt	53,628	Santa Barbara	1,601,217
Inyo	222,596	Santa Clara	470,130
Kern	4,912,095	Santa Cruz	296,349
Kings	33,000	Shasta	2,579,014
Lake	271,437	Sierra	520,990
Los Angeles	2,234,354	Siskiyou	806,877
Madera	183,987	Solano	201,091
Marin	207,835	Sonoma	318,871
Mariposa	393,592	Stanislaus	52,365
Mendocino	24,510	Tehama	9,000
Merced	3,500	Trinity	708,255
Mono	320,124	Tulare	32,313
Monterey	23,121	Tuolumne	1,389,774
Napa	261,910	Ventura	345,093
Nevada	3,214,828	Yolo	200
Orange	738,264	Yuba	325,384
Placer	798,644	Unapportioned	3,491,523
Total			$43,069,227

NERNST LAMPS are made in various sizes for use on alternating current circuits of 110 or 220 volts. They give a bright and steady light for shaft work, underground pump-stations, etc. Although the first cost is slightly higher than that of the ordinary incandescent lamp, the consumption of current is much lower, being only 88 watts for a light, equivalent to three 16 c.p. glow-lamps.

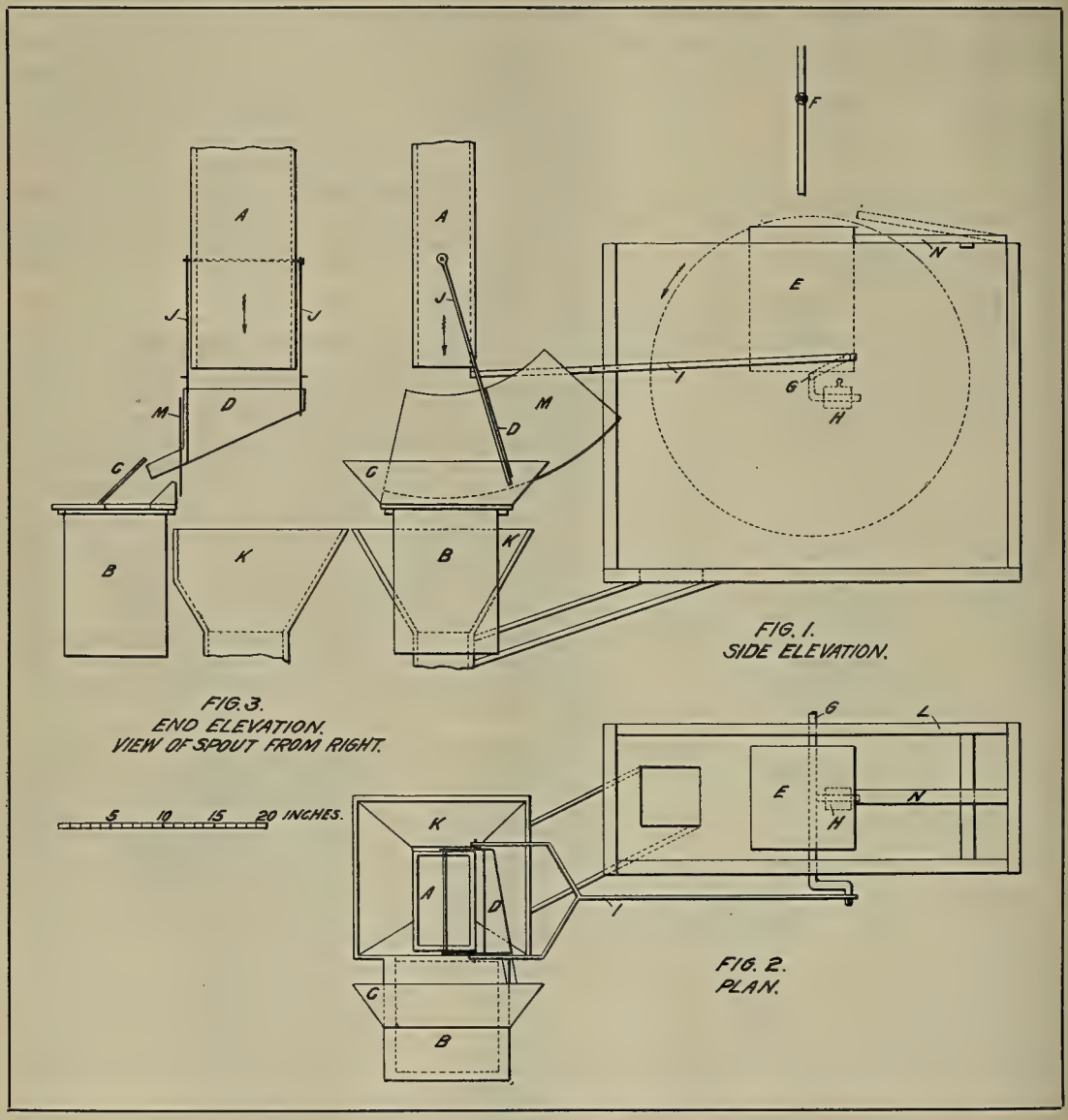
Some Tailing Samplers.

Written for the MINING AND SCIENTIFIC PRESS
By R. GILMAN BROWN.

It is hardly too much to say that of tailing samplers there should be no end, and the description of good devices of this class at least serves the laudable end of removing the underpinning from those who still evade the use of such devices. It can not but be remarkable that, even at this late day when so much has been written of the need of a systematic check on milling work, it should be rather the exception to find automatic samplers installed in smaller mills.

It is not the every-day mechanic who can devise a machine which at regular intervals can be self-instigated to take a quick cut through a stream of tailing, and many of the devices furnished by manufacturers are open to objection on the score of high cost, limited adaptability, and complicated mechanism. The two illustrated herewith are practical machines, which have been installed by home talent and have stood the test of long operation.

The first, illustrated in Fig. 1, 2, and 3, samples the tailing from the Ymir mill, in British Columbia. It can be described as follows: *A* is a vertical chute down which the tailing flows, *D* is a sampling box with 1/16-in. slot suspended by the hangers *J J*, which are free to swing. From the spout of *D* the sample runs into the receptacle *B*; the apron *M* guards against splash, and *C*, with its inclined cover, further protects the sample from accidental salting. When the sampler is in the position shown, the tailing-stream falls into the hopper *K*. The actuating device is shown at the right of Fig. 1. *F* is a water pipe with a regulating valve, *E* is a water can secured eccentrically on a crank-

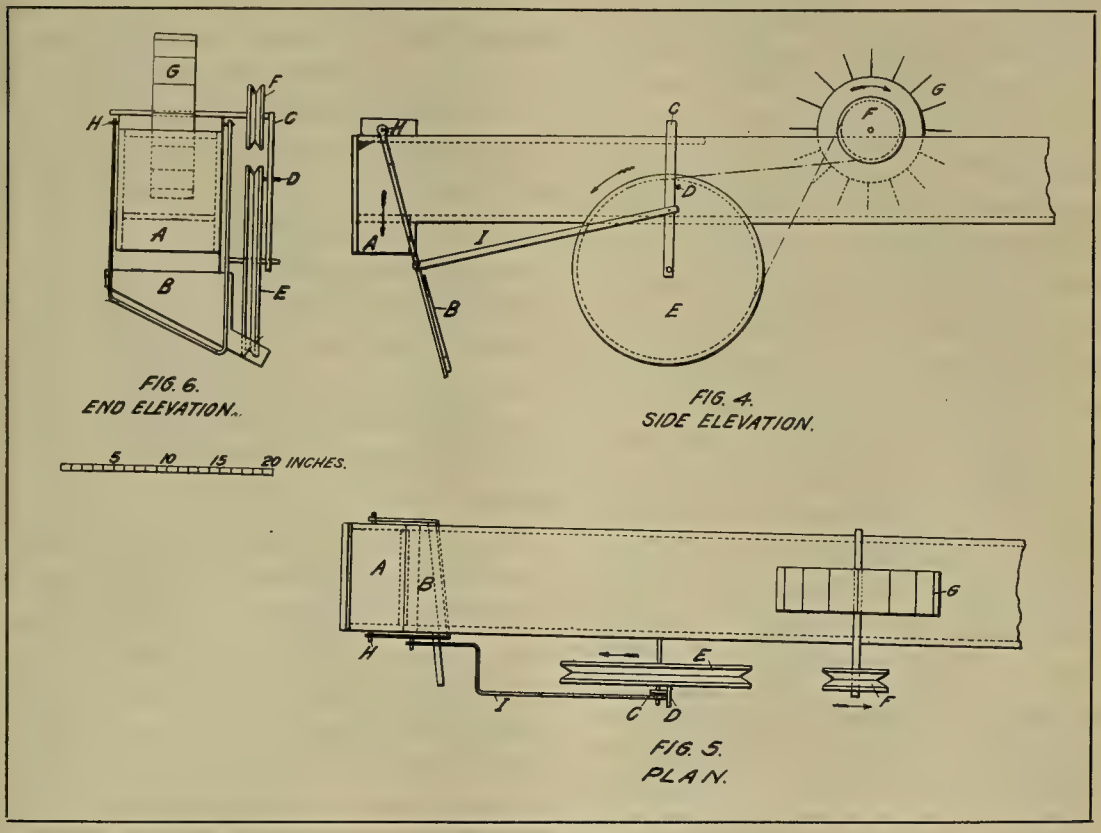


Tailing Sampler in Use at the Ymir Mill, B. C.

shaft *G* and held vertical by an adjustable weight *H*. The crank, through its connecting rod and fork *I*, causes *D* to swing back and forth through the stream of tailing.

The operation is as follows: When the water dripping from *F* has reached the proper point, it overbalances the counter-weight *H*, and *E* turns down toward the left, spills its water into the housing *L*, and is carried around by its inertia to its original position, raising the latch *N* as it passes and then falling back against it. By adjustment of *H*, this can be made to happen with little jar. It is easy to regulate this device to take samples from five minute intervals up to 30. *B* and *E* are the ordinary 5-gal. coal-oil cans of commerce. It should be noted that in Fig. 3 the actuating device has been omitted, and in

Fig 2, the apron *M*. The other device is installed at the cyanide plant of the same company. Here *A* (Fig. 4, 5, 6,) is the tailing chute and the sampling box *B* is suspended in the same way as before, with the exception that the hanger is bent from a single piece of iron ; this construction is demanded because the connecting rod *I* works only on one side. The actuating device is a flutter wheel *G* in the tailing-launder driving the grooved wheel *E* through the medium of a crossed cord. Hanging loose of the shaft of *E* is a heavy arm of iron *C*, connected by *I* to the sampling-box. The pin *D* carries *C* around with *E* until it reaches the position shown in Fig. 4. From this position *C* falls by its own weight to its lower position, swinging the sample-box through the stream. In the lower position it remains



Another Sampling Device.

until *D* catches up with it, when it is carried around again to the upper position. During this movement it swings *B* back still further out of the stream. This is a very pretty mechanical arrangement and works admirably. The use of the flutter wheel is, however, open to objection in that the time interval at which the sample is taken varies somewhat with the quantity of pulp passing. Assume that half the mill is hung up; if under this condition the wheel *G* revolves half as fast, the sample interval will be doubled, and as there is but half as much tailing dropping from *A*, the amount of sample taken for this period will be one-quarter of normal, when to give true results it should be one-half. With half the flow, no doubt the wheel *G* would not slow down to the same extent, but it would slow down slightly, and observation of the sampler in operation shows this to be the case. Moreover under the best of conditions the speed of *G* is not uniform, so that a better arrangement would be to have *E* actuated through the medium of some reduction gearing from the mill-shafting or from a water-wheel driven by a stream that can be regulated.

Freaks of Earthquakes.

From the MINING AND SCIENTIFIC PRESS, April 16, 1864.

The phenomena attending earthquakes, says an article on 'The God of Earthquakes,' in the London *Spectator*, are more apparently preternatural than those of any other human event. The ground assumes the appearance of running water, indeed, does transmit tidal waves as distinctly as the ocean itself. Not only are valleys exalted and hills made low, but nature appears to be working out on an awful and tragic scale the wonders of a pantomime. After the great earthquake of Quito in 1797 many whom the earthquake surprised in the town of Riobama were found as corpses on the top of a hill separated by a river from the place, and several hundred feet higher than the site of the town. The place was shown to Humboldt where the whole furniture of one house was found buried beneath the ruins of another, and it could only be accounted for by supposing that it had sunk into the earth at one spot and been disgorged at the other. In Calabria, in 1783, whole estates were literally shuffled, so that a plantation of mulberry trees was set down in the middle of a cornfield, and a field of lupines was removed into the middle of a vineyard. For several years after, lawsuits were actively carried on in the courts of Naples to reclaim landed property thus bodily conveyed, without legal forms, from one to another. Who can wonder that people who thus see what Englishmen emphatically call real property flying like shadows before their eyes, prostrate themselves before the great Earthquaker, in paroxysms of fear and superstition?

COPPER melts at about 2,000° F. or 1,093° C. When it is heated within two or three hundred degrees of its melting point, it becomes brittle and friable, and may be actually pulverized.

Contact Metamorphism in Its Relation to Ore Deposits.

By JAMES PARK.

[1]A molten magma tends to effect changes in the rocks with which it comes in contact. In the case of overflow magmas the thermal changes are generally trifling, and in many cases hardly appreciable. Even magmas that have cooled in rents in sedimentaries at shallow depths have not always caused great changes in the enclosing rock.

The greatest alteration will naturally take place in the case of magmas that do not reach the surface, but cool slowly under great pressure. The greater the mass of the intrusive magma, the slower will be the rate of cooling; and the slower the rate of cooling, the longer will the adjacent rocks be heated. The rate of cooling will be mainly dependent upon the mass of the intrusion, the distance from the surface, and the relative thermal conductivity of the adjacent rocks.

The changes effected in the country-rock by the intrusion of the igneous magma will be mechanical and hydrothermal. The intruded sedimentaries will be compressed, bent, and more or less shattered and fissured along the line of intrusion. The magma will part with its heat by slow radiation into the adjacent rocks. The magmatic steam and gases, together with the gases generated in the sedimentaries,[2] will pass into and permeate the latter, and cause a molecular rearrangement of the constituent minerals, resulting in what is termed 'contact metamorphism.' As the igneous magma and the heated sedimentaries cool they will contract in area, and when the temperature normal to the depth has been reached the contraction will tend to cause the two rocks to shrink from each other, resulting in the formation of cavities along the line of contact.

Above a temperature of 365° C., and a pressure of 200 atmospheres, water and all more or less volatile compounds will exist as gas. Aqueous vapors above the critical temperature and under great pressure will act as strongly upon the cooling magma as upon the adjacent rocks. They will possess a solvent power which will be greatest at the depth where the highest temperature and pressure are reached. The pressure will cause the heated steam and gaseous emanation carrying the heavy metals to permeate the bedding-planes of the sedimentaries, and fill all accessible cracks and fissures. In this way bed-impregnation may be effected, and even orebodies formed at points some distance from the genetic eruptive magma. A decrease in the temperature and pressure will cause the least soluble substances to be deposited; and as the temperature and pressure continue to diminish, the dissolved substances will be thrown out of solution in the inverse order of their solubility. It is manifest that the later phases of the eruptive after-actions will represent in a modified form the waning effects of solfataric action. The deep-seated conditions will also favor the action of metasomatic processes in the zone of metamorphism, and veins will be formed, some of which may rise to the surface. It is probable that the circulation of the heated mineralized solutions in the later phases will tend to effect a redistribution of the ores and minerals deposited in the earlier stages. In some cases the ascending waters and gases may reach the zone of surface circulation and mix with the meteoric waters, which will then reappear as hot springs, forming orebodies and veins not directly in contact with the eruptive magma.

Weed and some other writers have made an attempt to subdivide contact-metamorphic deposits into groups depending mainly upon the mode of occurrence. But the form and mode of distribution may be due to accidents of density or porosity, composition and hydrous condition of the rocks affected, rather than differences in genetic formation. Moreover, the mass of the magma, the weight of superincumbent rocks, the amount of heat and subsequent contraction, and phase of the after-action are all doubtless contributing factors in connection with the form and distribution of the heavy metals. Masses of ore occurring as contact deposits, fissure-veins, and bed-impregnations in the zone of metamorphism may all be traced to the same genetic causes.

De Launay supports the views of the school of De Beaumont and Daubrée in respect to the primary influence of volatile mineralizers emanating from eruptive magmas. The emanations, he contends, must have prepared the way by introducing into the enclosing rocks, or simply by depositing in the vein-fissures, elements such as sulphides, fluorides, chlorides, etc., which, subsequently dissolved anew by the circulation of superficial waters, have rendered the latter essential aid in the processes of alteration.[3]

The extent of contact metamorphism effected by the granite intrusions of Albany, in New Hampshire, was fully investigated by Hawes.[4] His analyses showed a progressive series of changes in the schists as they approached the granite. The rocks are dehydrated, boric and silicic acids have been added to them, and there appears to have been an infusion of alkali on the line of contact. He regarded the schists as having been impregnated by hot vapors and solutions emanating from the granite.

Contact deposits frequently lie at the boundary between the eruptive and the country-rock; also at variable distances from the eruptive, but never outside the zone of metamorphism. More particularly, contact ores occur in limestones, marly and clay slates, and are accompanied by the usual contact minerals, garnet, vesuvianite, scapolite, wollastonite, augite, mica, hornblende, etc., and in clay-slate by chiastolite, etc. Contact ores are principally magnetite and specular iron, but sulphide of copper, lead, and zinc often occur. Pyritic contact deposits are typically represented by those of Vegsnas, in Norway; Rio Tinto, Tharsis, and San Domingo, in Spain.

The pyritic ore-mass in Mount Lyell mine, Tasmania, is generally described as a contact deposit, although its geologic occurrence does not strictly conform to the common definition of such a body. It is a boat-shaped body lying between talcose schists and conglomerates.[5] The mine-workings have shown that it gradually tapers downward from the outcrop, being cut off below by a great thrust-plane. There are no eruptives in actual contact with the orebody, but dikes of diabase and other igneous rocks occur in the district at no great distance. The existence of these dikes and of bands of schist impregnated with sulphides forming fahlbands would lead to the belief that there at one time existed channels of communication leading from the eruptive rocks to the vein cavities. It seems probable that the orebodies in the Mount Lyell field were formed in the later or solfataric stages of eruptive after-actions.

Among the ore deposits genetically connected with eruptive after-actions Vogt[6] includes cassiterite and apa

[1]From *The New Zealand Mines Record.* Abstract of paper entitled 'Contact Metamorphism in Its Relation to the Genesis of Certain Ore Deposits' by Professor James Park, Director of the Otago University School of Mines, New Zealand.

[2]Professor Joseph Barrell has shown that the heat of an igneous mass acting upon sedimentaries liberates enormous volumes of steam and gases, attended by a shrinkage of volume of the rocks and the formation of vein-fissures: 'The Physical Effects of Contact Metamorphism.' Am. Jour. Sci., Vol. XIII, April, 1902, p. 279.

[3]L. de Launay, 'The Genesis of Ore Deposits,' 1901. Discussion, p 616.

[4]G. W. Hawes, Amer. Jour. Sci., Vol. XXI, 1881, p. 21.

[5]Prof. J. W. Gregory, 'The Mount Lyell Mining Field,' Trans. Aust. Min. Eng., Vol. I, Part 4, July, 1904, p. 281.

[6]J. H. L. Vogt, 'The Genesis of Ore Deposits,' A. I. M. E., p. 636.

tite veins and "ore-deposits of contact-metamorphic zone." Cassiterite deposits are everywhere connected with acid eruptives, principally granite, and occasionally quartz-porphyry and rhyolite. Partly for this reason, and partly because of the characteristic paragenesis of fluoride, borate, and phosphate minerals, he supports the common view that tin deposits are genetically connected with granitic eruptions, and that various volatile fluorides took part in their formation. Cassiterite veins were formed, he thinks, by pneumatolytic processes[7]—that is, by the action of gases and water at high temperature and pressure. He further urges that they were formed immediately after the eruption, and before the complete cooling of the granite, one proof of which is the occurrence of tin-vein minerals in veins of pegmatite in the granite.

Cassiterite veins are admittedly independent of the immediately adjacent country-rock, and for this reason seem to be more nearly related to deposits of magmatic segregation than to contract-metamorphic deposits.

It is probable that the magmatic segregation of chromite in peridotite was in some cases effected by pneumatolytic agencies before the complete cooling of the magma. It is not uncommon to find chromite in vein-like masses that have the appearance of having been segregated in cavities of contraction in the pasty magma. As the agency of underground water cannot have been active in this class of ore deposits, the aggregation must have been effected by metal-bearing steam and gases occluded in the igneous magma.

Pegmatite veins, while genetically connected with granitic eruptions, seem to be of later formation than the cassiterite veins. They often pass into quartz, and frequently possess sharp well-defined walls, which suggest their formation in shrinkage cracks by pneumato-hydatogenetic agencies in the waning phases of the after-actions developed by the progressive cooling of the eruptive magma. The different phases of after-action must necessarily merge into each other, and hence we may expect to find, as we do, tin-vein minerals and even cassiterite in veins of pegmatite.

Among ore deposits of contact-metamorphic origin Vogt includes the orebodies which occur within the metamorphosed contact zone of deep eruptives, especially granite. He distinguishes several types of contact deposit. The Christiania type includes iron-ore deposits that appear to have been formed before the solidification of the granitic magma. These ores are never found in the granite, but always in the adjacent rocks. If they had been introduced after the cooling of the magma they would also have been deposited in the granite. The eruptive magma is believed to be the source of the metal, which is expelled in the heated steam into the surrounding rocks.

The synthetic experiments of Daubrée seem to justify the views of Vogt, Beck, and other observers that cassiterite and pegmatite veins are formed by gaseous and aqueous emanations, and not by direct segregation.

PYRRHOTITE, according to Brogger, appears abundantly in altered rocks, and is certainly a mineral formed during the contact-metamorphism, for it does not occur in unaltered rocks. It is not easy to say whether an addition of material has really taken place, or the mineral represents a recrystallization of finely distributed pyrite. Strongly in favor of the hypothesis of direct addition is the fact that large accumulations of pyrrhotite exist in the contact-metamorphic rocks—so large, indeed, that mining has been attempted in places.

[7] 'Pneumatolysis' is a term first used by Bunsen to describe the combined action of gases and water.

Cheap Mining and Milling in South Dakota.

Written for the MINING AND SCIENTIFIC PRESS
By E. J. KENNEDY.

The Golden West mine, situated six miles southwest of Rochford, is equipped with one 6-ft. Chilean mill, with a capacity of 100 tons per 24 hours. Water-power is obtained from Castle creek through a flume 8,425 ft. long, having dimensions of 30 by 40 in., and a pipe-line 26 in. diam., 2,740 ft. long, with 123 ft. net fall; this furnishes 500 h.p. There is an aerial tramway one-half mile long, connecting the mine to the mill; the tram buckets dump into a large crusher and the mill is all built on the gravity plan. One man runs the whole mill on the day shift and another does it at night. There is one man at each end of the tramway. Four miners and one hoisting engineer work from a glory hole, so that the whole cost of mining, hauling, and milling this season runs a fraction under 50 cents per ton. A large body of ore and of slightly better grade was opened up this summer east of the old workings. A glory hole 60 ft. across in every direction and 30 ft. deep has been opened up and still has the same grade of ore on all sides and at the bottom.

Our Chilean mill has not proved satisfactory as an amalgamator, the saving being about $1.50 and the loss in free gold $1.20, besides about $0.80 in refractory material, which yields 85% in 72 hours by cyanide treatment. Our plans for the future are to shut down this month and commence the work of reconstruction for next season by installing three Chilean mills of the Lane type, namely, 10 ft. diam., the six rollers making 10 rev. per min.; these mills to take the product from the Chilean mill we have now.

After the ore has passed through two crushers, we shall use screens with ¼-in. holes on our 6-ft. mill, with low discharge, running about 150 tons per day through it and distributing 50 tons to each Lane mill, where we expect to amalgamate at least 80% in the mortars. We find, after four years' experimenting with Chilean mills, that our ore needs fine grinding and much polishing to amalgamate well, and that a Chilean mill will do this, but it must have slow speed, high discharge, and the screens must not be too close to the wheels, nor the wheels too heavy, and the product must be fed to the mills at about ¼-in. size, to do good work. The wear on steel, so far, in our Chilean mill, has been 2.3c. per ton of ore.

We shall then put in a Dibble slime separator, a new invention just out and patented by H. D. Dibble, of Mystic, South Dakota, by which the slime will be run off, being of no value, and the sand and coarser material will be cyanided, which means cyanidation of about 30% of the whole product as the ore runs now; but with greater depth the slime will be less and the concentrate increasing. We shall install a boiler and engine next fall for winter use, that is, during the four months when the creek runs to slush and ice; this, however, will not be very expensive in our case, as wood is plentiful close to the mill and there is enough of it to last for many years.

THE minute difference of 0.006 between the weight of a litre of atmospheric nitrogen and that (1.251) of chemical nitrogen led Lord Rayleigh and Sir William Ramsay to the discovery of a new element, which in turn led up to the discovery of others of perhaps greater importance. That a change in the third decimal should lead to such brilliant discoveries tends to show, not only the accuracy of modern scientific investigation, but also the wide field available for original chemical research, leading, doubtless, to the discovery of many new and possibly much needed elements.

Copper Mining in Nevada.

By MARK L. REQUA.

*Ores that today present no difficulties from a metallurgical standpoint, twenty years ago were absolutely valueless. The conditions of today have been brought about by the experience that has been gained from the operations in the great copper camps of the West during the past decade, from Montana to Arizona, and from Utah to California. Had the problem that was presented to me on my first visit to this district been presented even five years previous, its solution would have been considered hopeless—in fact, I may say that the problems surrounding the working of these very low-grade ores have only been worked out satisfactorily within the last two years; and it is due to the Bingham district of Utah, more than to any other, that we have today absolute data based upon actual work, rather than empirical estimates.

The metallurgy of the high-grade gold and silver ores was successfully worked out upon the Comstock, and the smelting of lead ores at Eureka, but for the metallurgy of copper we must first of all turn to Montana, where the high-grade ores of Butte permitted extensive experimenting, the results of which have revolutionized the copper industry of the world. From Montana to Arizona, through the camps of Bisbee, Clifton, Morenci, and Globe; also at Granby, in British Columbia, and at Bingham, all with their varying problems, both of local environment and different mineralogical conditions, the metallurgy of copper has been worked out from the high-grade smelting ore, both oxide and sulphide, to the lean concentrating ores that are characteristic of Ely, and that are found in identical occurrences at Bingham and the Clifton-Morenci district of Arizona.

Fortunate, indeed, has it been for the West that the great deposits of high-grade ore yielded not only a profit with what now appears to have been the crudest of metallurgical appliances, but also permitted of extensive experiments, which, in their sequence, have made possible the profitable exploitation of low-grade bodies that bid fair in ultimate production to surpass the high-grade districts. Few people realize the evolution that has been taking place in the copper industry of the West during the past two or three years. The low-grade porphyry deposits which are being exploited at Bingham and Ely have come to be looked upon as the future source of the great copper output of the West, and, owing to their enormous tonnage, it is possible to forecast their production far beyond the life of the present generation.

It would be the height of folly to say that the methods of handling these ores have been perfected. We are today confronted at the first step of our process with a loss of from 15 to 20%, which is carried away in the tailing from our concentrators. I know of no field so promising for the winning of a large fortune as the perfecting of some method whereby the loss in concentration may be eliminated, or at least largely reduced. The smelting processes are much nearer perfection, but, with all that, it is safe to say that the plant which we are going to erect for the treatment of these ores will, within ten years, be obsolete. In fact, I believe that we shall, within five years, see changes that will materially alter our process in some of its most vital points. We are, however, building here at this time the very best plant that the combined knowledge of modern copper metallurgy is capable of producing, and I can say without fear of contradiction that, when finished and in operation, it will be the most modern and economical copper reduction plant in the world.

*Abstract from an address delivered at the driving of the last spike of the Nevada Northern Railway at Ely, on September 29, 1906.

The task of bringing this undertaking to successful fruition has not been an easy one. On my first visit, I saw only the signs of repeated failures; the efforts that had been made to wring profits from the rocks had been without success and my first day's inspection convinced me that, if there was to be success, it must be along lines radically different from those that had already been tried. After a week's study, the problem had resolved itself to a very simple one, save for the unknown factor that must be supplied in order to make the problem susceptible of solution. I saw before me a mineralized zone wherein the question of tonnage had even at that time, to my mind, been entirely eliminated. The unknown co-efficient for which I was searching could only be determined by extensive development work; that co-efficient was the average copper content of the porphyry in large masses. I had seen upon the surface streaks of high-grade ore that in themselves were interesting, but which did not hold forth prospects of a tonnage sufficiently large to justify the expenditure that I knew must be made in order to put the copper into marketable form. I saw in those early days that the only hope for this district was in developing tonnage of such magnitude and value as would justify the building of a railroad from the Southern Pacific. This meant the building of a line approximately 150 miles long, to justify which would require the development of millions of tons of copper-bearing ore. I had crawled down the Ruth mine 300 ft. on the incline and seen 40 ft. of a cross-cut that averaged approximately three per cent, with apparently no end in either direction. I had seen this same porphyry upon the surface leached of its copper, extending for hundreds of feet in width, and I knew that underground development would reveal enormous masses of this material, but I did not know what the copper content of it would be. It was, therefore, necessary first to develop this ore and determine its value not only sufficiently to justify the building of a railway, but sufficient in quantity to justify an enormous reduction plant, because profits could not be hoped for unless the ore was handled by the thousands of tons per day. Over a period of two years this prospecting work was carried on until a large tonnage of ore was developed. Even then, the railway was not justified, because there was no certainty as to what could be done with the ore in concentration. To determine this factor, a small experimental mill was built at the Ruth mine, which was operated during a period of three months, and most exhaustive tests and determinations made. The entire mine, in fact, was sampled by means of this mill; the results were compared, tabulated, and carefully scrutinized. That these results were satisfactory, is proved by the building of the Nevada Northern Railway, which was undertaken immediately after these mill-tests were completed.

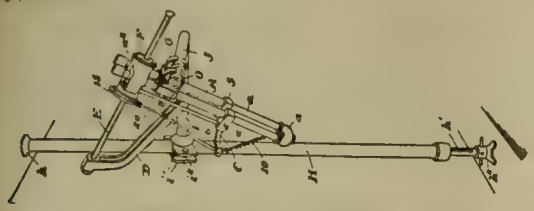
In the meantime there had been effected the consolidation of the New York & Nevada and the White Pine properties under the name of the Nevada Consolidated Copper Co. At Copper Flat we had not been idle and the tonnage developed at Ruth is more than equaled by the tremendous body of ore at the Flat, whose limits have not as yet been defined. I think you will agree with me that we were justified in suspending development work, when I say that there is developed at Copper Flat and at Ruth ore sufficient to supply this reduction plant for at least ten years, with the largest part of our ground still unprospected, but giving every evidence of containing ore similar to that we have already developed. It was to meet this situation and afford means for working this ore that the Nevada Northern Railway was built.

PROCLAIM human equality as loudly as you like, Witless will serve his brother.

MINING AND METALLURGICAL PATENTS.

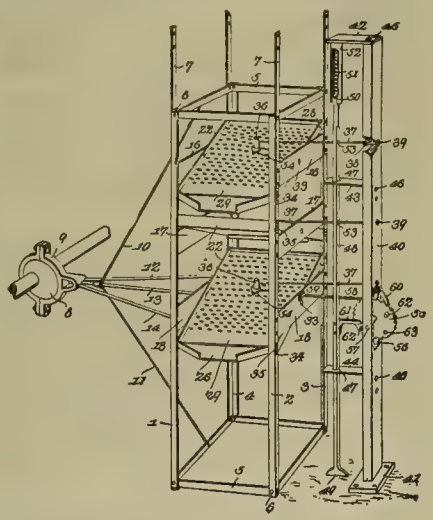
Specially Reported for the MINING AND SCIENTIFIC PRESS.

MINING-MACHINE.—No. 831,516; Charles Mead, Murray, Idaho.



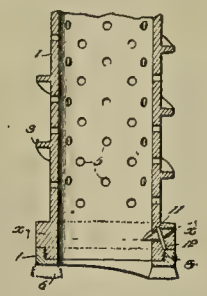
In a machine of the class described, a frame, a lever fulcrumed thereon, a rigid striking-arm pivoted to said lever and supported thereby, a drill fitted to the striking-arm for movement with the same, and means operating through the lever for holding the striking-arm and the drill in working positions.

ORE-SIZING SCREEN.—No. 831,681; Clarence E. Ratcliff and Jacob A. Cohenour, Salem, Kentucky.



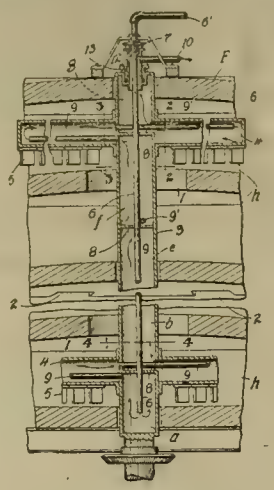
In an ore-sizing screen the combination with a plurality of rigidly connected screens, and means for vibrating them in unison; of a rotatable rachet-wheel, means for holding the wheel against movement in one direction, a lifter extending from said wheel, a spring-pressed rod disposed adjacent the wheel and springs, a toe extending from said rod and into the path of the lifter, hammers extending through the rod and above, and adapted to strike, the screens, and means actuated by the vibration of the screens for rotating the rachet-wheel to trip the toe and hammers after a predetermined number of vibrations.

MINING-DRILL.—No. 831,056; Benjamin V. Gilmore, Red House Shoals, West Virginia.



A hollow tubular mining-tool, a cutter detachably fitted to an end thereof, an inner cutter and a pin for securing the inner cutter in place and in turn prevented from displacement by the said removable end cutter.

ROASTING-FURNACE.—No. 831,165; Frank Klepetko, New York, N. Y.

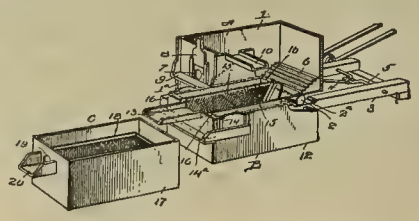


In a rabble apparatus, a hollow shaft and hollow arms therefor, a feeder passing centrally through the shaft and discharging a cooling medium thereinto at one end of the shaft, and means for circulating said medium through the shaft and arms vertically in series, and radially through a multiple, substantially as set forth.

PROCESS FOR THE ELECTROLYTIC PRODUCTION OF COPPER.—No. 830,639; Johannes A. W. Borchers, Aachen, Paul R. Franke, Eisleben, and Franz E. Gunther, Aachen, Germany.

The process for the direct electrolytic production of pure copper from copper matte which consists in first bringing the copper matte to a richness of between 72 and 80% of copper, and then using said matte as an anode in an electrolyte composed of an acid solution of copper sulphate.

ORE-SLIMER.—No. 832,091; William F. Smith, Whitecross, Colorado.



In an ore-slimer, the combination with a receptacle for dispensing ore tailing, of a series of slime-filters made up of intermediate boxes having outlet openings in their walls, removable screens mounted within said walls, means for binding the screens in place, and an end filtering-box having liquid outlets in its walls and side and end inclined screens converging upwardly and arranged to intercept the liquids as they pass out of said end box.

ORE-CONCENTRATOR.—No. 830,425; William E. Ford, Carthage, Missouri.

In a mechanism of the class described, the combination with a reciprocating bed, means for reciprocating the bed, said means comprising an unbroken rock-shaft, a crank carried by the rock-shaft, a curved link pivoted to said crank and disposed with its concaved side toward the said rock-shaft and being arranged to receive the said shaft in its concavity and connections between the said link and the bed to reciprocate the latter when the crank is rocked, said crank being arranged to extend when at the limit of its movement toward the bed, at a lesser angle to the plane of movement of the bed than when the crank is at the limit of its movement away from the bed.

Repairing a Cracked Cylinder.

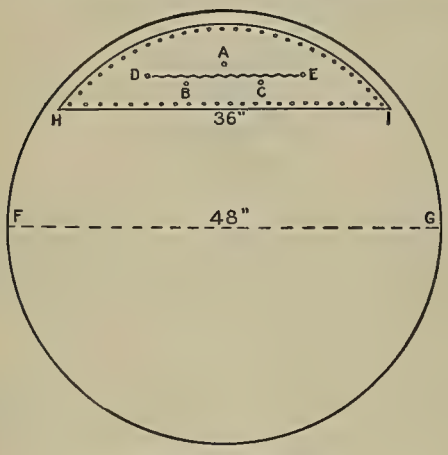
The method of making the repair was as follows:

1. While the cylinder was hot a partial vacuum was created in it and Smooth-On Elastic Cement was painted over the crack. The vacuum drew the cement in, and this operation was continued until the crack would take up no more cement.

2. Holes were then drilled and tapped at the end of the crack, *D* and *E*, and bolts put in to prevent a further extension of the crack.

3. The patch was cut as represented on the accompanying illustration.

4. The crack was then painted with Smooth-On and the



Repairing a Cracked Cylinder.

patch laid in position. Then it was carefully removed. The imprint of the crack was now shown on the under side of the patch, the Smooth-On sticking to it. The patch was then dished along the line of the imprint to make a recess to hold sufficient cement.

5. The plate was then warmed and a compound composed of Smooth-On Iron Cement No. 1 and Smooth-On Elastic Cement, mixed half and half, applied to the warm plate with a small trowel, making a thin, even coating.

6. Then the patch was laid in position. The three centre bolts, *A*, *B*, and *C*, nearest the crack were brought up, just taut. Then the outside bolts were brought up tight, and lastly, the three centre bolts were brought up as tight as possible, which forced the cement into the crack. The steam was turned on and the crack was tight.

Air-Compressor Lubrication.

Some time ago in the course of an article on 'Temperatures in Air and Ammonia Compressor Cylinders' which was published in *The Engineering Magazine*, Mr. Leicester Allen wrote: "One of the dangers in air compression which has not been fully recognized until quite a recent period is the liability to explosion in air-compressor cylinders when the heat of compression is caused to exceed the flashing point of the oil used for cylinder lubrication. Several more or less serious accidents of this nature have been recorded within a period of three or four years." Another writer, Mr. Alex. M. Gow, in the *Engineering News*, said: "Ignitions and explosions in the discharge-pipes and receivers of air-compressors are by no means uncommon, and for very obvious reasons the manufacturers say as little as possible about the subject to prospective buyers. It cannot be expected that the men in charge at the time of accidents will make any report that will reflect upon themselves. So it happens that in but comparatively few cases of these accidents have the results of careful investigation been given to the world at large." The matter is nevertheless brought up for discussion from time to time in engineering papers, and the facts presented strongly emphasize the necessity for a clearer understanding of conditions and causes of explosions in compressed-air systems on the part of those operating them. The causes of ignitions and explosions in discharge-pipes in air receivers and the function and the value of Dixon's Flake graphite as an air-cylinder lubricant from the theoretical as well as the practical standpoint is very fully and fittingly set forth in an entirely new pamphlet issued by the Joseph Dixon Crucible Co., of Jersey City. It is entitled 'Air-Compressor Lubrication.' Manufacturers of air-compressors and users of compressors, drills, and all compressed-air apparatus will be on the wise side if they send for a copy of this pamphlet.

Commercial Paragraphs.

THE RISDON IRON & LOCOMOTIVE WORKS has issued Bulletins No 19–1 and 19–2, describing the silver-lead and copper blast-furnaces which this company manfactures.

J. H. ELLSPASS, of the Ellspass Engineering Co. and Samson Mfg. Co., is making an extended trip to Pittsburg, New York, and other Eastern cities, on business connected with his companies.

THE RIX COMPRESSED AIR & DRILL CO. is now occupying new offices at 219-221 Spear St., San Francisco. The factory, warehouse, and branch office are at 1436 Fifth St., Oakland, between Centre and Cypress Streets.

THE HENDRIE & BOLTHOFF MFG. & SUPPY CO., of Denver, has issued catalogues describing the Dorr classifier and the Card concentrator. As both of these machines are winning favor among millmen, the descriptions given in these catalogues ought to prove useful.

A. MERLE & CO., successors to San Francisco Novelty & Plating Works, have completed their office and factories at Bay and Stockton St., San Francisco. This firm, established in 1865, claims to be the largest manufacturer of silver-plated copper amalgamating plates in America.

THE CROCKER-WHEELER CO., of Ampere, N. J., has shipped within the last few days nine carloads of electrical machinery exclusive of other smaller shipments to the following large concerns: The National Tube Co., the Lehigh Portland Cement Co., the Snow Steam Pump Co., the Crocker-Wheeler Co., at San Francisco.

THE CHICAGO PNEUMATIC TOOL CO. announces that it is enlarging its machine-shops to increase its output from 55 to 70 compressors per month. An interesting pamphlet just published by the company shows that the compressors, 1,000 of which have been turned out in the last three years, are finding world-wide appreciation.

THE CROCKER-WHEELER CO. announces the following sales: To Armour & Co., South Omaha, Neb., 6 Form I motors, 230 volt, shunt wound; to the Salt Lake Hardware Co., Salt Lake City, Utah, two 50 k. w., 125 v., D. C. generators, driven by Ball engine; to the Colorado Iron Works Co., Denver, Colo., 4 motors, 230 v., shunt wound, and one 40 k. w. generator, 250 volts.

THE BUFFALO FORGE CO. is bringing out new designs of forges with its characteristic initiative. The light and inexpensive hand-blowers are well known for their power and durability. An attachment by which a tiny jet of compressed air may be made to impinge on the fan blades, causing them to revolve and draw in a volume of air very much larger than that of the compressed air used, is an interesting feature of new designs.

HENSHAW, BULKLEY & CO., the well-known machinery house of San Francisco, whose offices were formerly located at the northwest corner of Fremont and Mission streets, is now at 219-221 Spear street, near Howard. The new offices are well appointed and each department is provided for in a spacious and well-lighted room. The firm extends an invitation to the general public, particularly that part of it interested in machinery, to visit the new offices. Within the past few months this company has established sales offices and warehouses in the cities of Los Angeles and Oakland.

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Editorial.

THE PURCHASE of the control of the Nipissing mines at Cobalt by the Guggenheim Exploration Company is an important event and will draw further attention to that most interesting district in northern Ontario. The veins are characterized by high-grade silver ore, with pockets of the native metal. At the recent high price of $34 per share, the property represents a market valuation of $40,800,000.

SPEAKING OF COPPER, the high price of the metal and the speculation in the shares of copper mining companies are stimulating prospecting to a notable degree. The Greenwater district, just over the Nevada line and in Inyo county, California, is being greatly boomed, but there is substantial basis for it. Some fine bodies of ore have been uncovered there. It appears also that in the Gore range, in Colorado, near the line of the new Moffat railroad and on the west slope of the Rocky Mountains, an important find of copper ore has been made. Colorado produces but little copper and any large output would be important, especially from a smelting standpoint.

ON ANOTHER PAGE we publish an earnest plea for the better recognition of the value of geology in mine development. We are glad to give Mr. John A. Reid space for his statement of the case. Others may wish to discuss the matter. Certainly, the application of geology has made great strides in an industrial, as well as a scientific way. Geologists experienced in the structure of ore deposits are in demand among mine operators. We may instance the cases of W. F. Ferrier, Walter P. Jenney, J. E. Spurr, H. W. Turner, Horace V. Winchell, and others, who, as specialists, are regularly retained by important financial organizations to give advice on the exploration and development of mines. It is a pity that the increased appreciation of the importance of this branch of mining engineering should have taken away from the Geological Surveys of the United States and of Canada several able scientists, but it is the inevitable result of governmental parsimony as compared to industrial exhuberance.

A JUDGE OF the Superior Court of Solano county has granted an injunction against the Selby Smelting & Lead Co. at the instance of Solano county. It is his opinion that the fumes hurt the health of the people on his side of the water more than that of those on the Port Costa side. It seems anomalous that a case brought by the farmers of Solano county should be tried before a judge elected by the farmers of Solano county. However, the judge counseled the plaintiff to be gentle in enforcing the injunction. Meanwhile, we also venture to recommend the farmers to be reasonable, and suggest that they take note of the action of their co-agriculturists in the Salt

Lake valley, who have reached a settlement with the smelters in that thriving region. And it thrives, not only despite the noxious fumes of sulphur and arsenic, but by reason of them. Smelter smoke makes farmers fat, if they did but know it. It is the sign thrown across the heavens to signal the prosperity of an industry that gives the farmer the best market for his produce. The Salt Lake valley is rich today because the surrounding mountain region contains active mining communities that consume agricultural products. Wherever the smelters are willing to pay for actual damage done to adjoining land or cattle, we hope public opinion will resent any attempt to blackmail them. A big industry must not be side-tracked to please a few cows. In the meanwhile metallurgists will do well to improve appliances for condensing fume and collecting flue-dust, to the end that any injury may be minimized.

Make-Believe Reformers.

The decisive defeat of W. R. Hearst should encourage good citizens and warn pseudo-reformers, who make noises only, like coyotes before the dawn. We suffer from piracy in finance and corruption in municipal government, but we suffer also from insincerity of purpose among those who pretend to make it their business to correct existing evils. Two men have become famous or infamous — as you will — by their attempts to excite resentment against those who are dominant in business and politics. We refer to Thomas W. Lawson, of Boston, and W. R. Hearst, of San Francisco and New York. For Lawson we have some respect; for Hearst none. Lawson did good service in exposing the ways of low finance, and he did it with a literary skill that made the performance artistic. He gained a wide hearing even among thoughtful people, for his raciness of diction and command of slang, his intimate knowledge of the ways of Wall Street, and of the honor that obtains among thieves, give his writings the value of a chronicle of the time. To his credit belongs the exposure of the insurance companies and the better recognition of the fast-and-loose methods of predatory promoting. If he had been sincere, he could have formed a party and led a reformation; but he was not. In the very midst of his crusade he worked a small game; he played the stock market and took advantage of his notoriety to invite inexperienced speculators to entrust their money to him. The crusade became a farce. He proved himself a sham; a brilliant pamphleteer, but a small man. The cause of real reform was flouted. But irresponsible, pyrotechnic, and insincere as he is, Lawson aroused none of the disgust that Hearst has stirred across the entire continent. He throws a spadeful of garbage every morning into the faces of the citizens of New York, Boston, and San Francisco, and he calls it journalism. Heaven forbid! Journalism is what Franklin founded, what William Lloyd Garrison and Horace Greeley honored, and what Hearst has only prostituted. It has been his particular function to prove how powerful the press is — for evil. It has been given to him to demonstrate what foul anarchy can be stirred by those who masquerade as statesmen. It has been permitted to him to show how men of vile character may by force of native intelligence and the power of inherited wealth, so deceive a large portion of the unthinking voters as to be nominated for a high office. And it would be a dark outlook, indeed, if we were not able to record this week that he has been taught a lesson so severe as to make another unnecessary.

We need reform and we need reformers, but not so badly as to follow the leadership of insincere spoofers like Lawson, or unprincipled demagogues like Hearst. And it is a thousand pities that at a time like this the effort to check corruption in public office, in commerce, and in finance should be discredited by the assumed guidance of such men. We need character in our leaders, fixity of purpose, and sincerity of mind, strong men in a time of blatant talk. The election in New York demonstrated the force of such a man. When the President told the people of his State just what he thought of Mr. Hearst, the effect was at once apparent; a man of character flattened out the man of no character. Mr. Roosevelt does many things in a hurry, some of them injudicious; he takes himself a little too seriously, as if lacking a sense of humor in important affairs; nevertheless, it heartens the essential manhood of the country when he comes out squarely for right-doing and right-thinking. Lawson is but a clown in the circus of down-town finance; Hearst, the man-hole of a sewer. No good can come to a good cause when led by such as they.

A Mining Exchange for New York.

Interest in mining speculation has grown exceedingly during the last three months. The volume of trading in stocks on the New York and Boston curbs has assumed surprising proportions, and it has received the attention of some of the best Stock Exchange brokers. On Broad Street the sales have aggregated a million shares per week and on single days the total has been known to exceed 300,000 shares. There have been some spectacular rises; for instance, Nipissing has risen since August 13 from 5⅞ to 34, the par value being $5; Cumberland-Ely has jumped from 7⅜ to 14½; Giroux Copper from 7 to 14½; and there are other cases, such as Nevada Consolidated which was lately $22 and was $6 a little over a year ago. Naturally these tremendous advances have made fortunes for many men, and in several cases the rise has been amply warranted by mineral discoveries of unusual richness or extent. The result has been to create wide interest in other low-priced mining stocks and to stimulate the speculative activities of those who play with money. As viewed from a distance, the large operations on the curb emphasize once more the need of a properly organized and respectable mining exchange. Such an institution, while affording better facilities than the peripatetic concourse in the open air that now does duty for a mart in New York, would permit of some regulation of the business and a control over the doings of irresponsible people. As it is, every boom on the curb is followed by a scandal, disclosing washed sales, disreputable promoters, and unhappy dupes. Such episodes hurt the real business of buying and selling of shares in profitable mines and legitimate ventures. Without properly constituted authority, such a market as the curb is a menace to mining.

By the Way.

Mr. James Douglas gave a most informing address at Columbia University recently, on the relations of railroad transportation to mining and metallurgy. He said, in part:

The marvelous feats which two generations of engineers, in handling steam and electricity, have enabled us to perform, may not be duplicated by equal progress during the next half century; but it goes without saying that but for our transportation facilities we would not occupy in the world's race the same advanced position we have acquired today, for the very vastness of our country, and the actual distance, from one another and from population of our resources, would have rendered many of them valueless. But, given control of steam, the great size of our mineral deposits and the long distance our continental areas require that we transport material, has inspired our transportation engineers to work on a larger scale than their fellow craftsmen across the sea. We handle longer trains, with larger cars, and as a rule at a much lower rate of freight than they do. Otherwise, neither our miner nor our metallurgist could perform the duty required of them.

Take, for instance, the cost of transporting a ton of iron ore from Lake Superior to Pittsburg: 70 cents from the mines to Duluth, a distance of 80 miles; 75 cents for 1,000 miles by steamer to Cleveland (though the rate has been as low as 57 cents, and though, when the first shipments were made from Michigan in 1856, the rate was $3); then $1.18 from Lake Erie points to Pittsburg, a distance of 135 miles — making the total transportation $2.63 for 1,250 miles, including transfers.

Or take the $10 rate at which copper is transported from Montana to the Atlantic, a distance of nearly 3,000 miles. Soft coal is carried by Eastern roads at about a half-cent per ton a mile, but the rate on some Western roads is as low as 40 mills per ton-mile. Nor is it only in the iron trade that low rates of carriage have helped us metallurgists.

The necessity of low fuel rates to economical metallurgy is obvious, especially when treating ores such as those of copper, whose percentage of valuable metal is so low that, even after water concentration, as many as twenty tons of charge are probably smelted on an average to yield one ton of copper. In such cases the fuel must be carried to the ore — not the ore to the fuel, as when smelting rich iron ores. At the Copper Queen works in the early days the cheapest coke was Cardiff Patent Pressed brought round the Horn in wheat ships to San Francisco. It costs more than three times the price at which New Mexico or Colorado coke is now delivered, after a railroad haul of from 800 to 1,000 miles. Coal for steam generation was then so costly that the country was swept clear of its scanty accessible forests. For raising steam crude oil is now brought in from Texas and California at a freight rate not exceeding three-fourths cent per ton-mile; so that at one smelting works in southern Arizona 700 miles away from the nearest coal, or available petroleum wells, power is generated at a cost for fuel, maintenance, and all expenses, of $79 per ton per year. Montana draws its coke largely from Pennsylvania, or from coke ovens on Lake Superior, fed with Pennsylvania coal, the fuel traveling over 2,000 miles from the pits to the furnaces.

While complaint may be made against some railroads for charging exorbitant rates on coal, our Western roads are certainly not culpable, or Montana would not be able to turn out in metallic copper about one-fifth of the world's total, and Arizona about one-seventh of the world's total, though both are situated in the heart of a continent, and between 2,000 and 3,000 miles distant from the point where their crude product is refined and marketed.

The interdependence of mines on railroads and of railroads on mines is best appreciated by some familiar examples of what each does. Butte, both the town and the great Butte mines, are situated on a mountain side facing a valley beneath whose surface water can be reached in any quantity and at all seasons only by wells, but where none flows. The two great corporations operating there have been obliged, therefore, if they were to concentrate mechanically their large tonnage of low-grade ore, to transport their ores to water. A site 26 miles distant was selected by the Anaconda Co., and thither to their new Washoe works are carried daily from Butte, of their own and custom ore, about 9,000 tons at a cost of about $5 per car, or 14 cents per ton. As the ore contains less than three per cent of copper per ton and $1.29 in gold and silver, a haul of that length would be profitable only if carried at such low rates of freight. The other large company, the Boston & Montana Co., sends its ores 170 miles to Great Falls, where, however, the company has the advantage of water-power.

An interesting instance of the facilities which transportation gives the metallurgist is afforded by the shipment of copper matte from Tennessee to the heart of Mexico, where it has been used to collect gold and silver from dry ores in the furnace and converter, and then returned for electrolytic refining and separation to the United States. Copper bars come from New Zealand to be refined here, and the refined copper is returned to Europe for consumption, for we ship abroad about 40% of our production. But for cheap carriage, often for long distances, of ore necessary to make a profitable mixture in lead and copper furnaces, many a district would be unexplored and unexploited. Till recently, for instance, the mines at Globe, Arizona, languished for want of sulphur and iron flux, and could barely make a million tons of copper per month. But the railroads, appreciating the needs of the miner, and appreciating what is their own true interest, published a low-ore tariff which enabled pyrite to be imported from distant districts where it is in excess; and as a result the production rapidly rose to three million pounds per month.

The copper industry, as compared with the iron trade, if gauged by the quantity of copper produced, is insignificant; but if measured by the ore raised in making a ton of copper, it assumed very different proportions. Instead of two tons of ore to the ton of metal, as in the case of iron, the average of ore mined, previous to water concentration. is more nearly 40 tons, and therefore there are handled, to make our 460,000 tons of copper, about 18,000,000 tons of ore. Though this is not carried the same distance that iron ore is carried to fuel, nearly all of it is moved by steam for a longer or shorter distance; and as about four tons of fuel are consumed to make one ton of copper, nearly twenty million tons of freight must be carried by the railroads to enable us to maintain our position in the copper world.

Our Western copper industry, like our iron industry, sprang into life at the touch of the railroad. Not until the Southern Pacific approached Arizona in 1880 was any notable copper made there, and the railroad alone galvanized Butte within a year afterward into activity. And today our increasing production of that much sought after metal is due either to railroad extension into new regions or to lower freight rates over existing railroads. For our railroads have been learning that their prosperity depends on the healthy growth of the industries along their lines, and that these industries can be starved to death by high freight rates, or fed into lusty vigor by encouragement.

Special Correspondence.

Johannesburg, Transvaal.

The Rand Has a Birthday.—Its Tumultuous Past and Agitated Present.—A Big Output.—Deep Levels in Trouble.—An Experiment With Cape Boys.—Labor Situation Bad.—More Diamond Prospects.

A few days ago Johannesburg attained its twentieth birthday, and the event was celebrated by the *Rand Daily Mail* with a special edition, reviewing the history and progress of this city during the past twenty years. It is a truly wonderful story. To build upon the bleak barren veldt a city like this, to inaugurate an industry that is producing over £2,000,000 worth of gold per month, is an achievement to be proud of. In reviewing the past, one is struck with the atmosphere of unrest that has prevailed. Johannesburg never seems to be at peace. There is always something to stir up the community, either a raid, a monopoly, a war, or anti-Chinese agitation. Give us peace, and the future of this place will be far greater than the past. Another phase that strikes the reviewer is the spirit of gambling that has existed and still prevails. The number of wild-cat schemes that have been promoted in the past is almost incredible. Today Johannesburg is having hard times, yet at a recent race meeting, there was a turn over of nearly £19,000. However, there is not a place in the world where mining is on a firmer business foundation than it is here. It is to be hoped that the days of the charlatan are over.

August proved a notable month so far as output is concerned, for the total of 509,115 oz. was a record output. The labor supply has not increased during the past month, so that the improvement is due to greater efficiency of the labor at work. The Chinese mines are making a fine showing. The coolies are well trained by this time, and are now excellent laborers. The highest crushing duty per stamp per 24 hours was made by the Luipaard's Vlei Estate, which returns a duty of 7.63 tons. The percentage of waste rock sorted out shows a considerable variation on the different mines. On the Consolidated Langlaagte there was no waste sorted, while on the Princess Estate 35.31% of the tonnage mined was discarded as waste.

The deep levels are beginning to feel the hard times rather severely. A meeting of the shareholders of the Vogelstruis Consolidated Deep, held a few days ago, shows the position of this half-developed mine to be rather desperate. Bantjes Deep has been placed in provisional liquidation, with a huge debt. It would be difficult to float a new deep level these days. In the past there has been no difficulty in getting funds, but now money seems scarce, as people are afraid of the future.

The native labor position is far from satisfactory. The ebb and flow of Kaffirs to the Rand is most exasperating. It is impossible to run an industry like this with labor as erratic as Kaffir labor. An experiment is being made with 'Cape boys' (half-caste laborers from Cape Colony), but these half-castes are not proving a success. They are more expensive than either the Kaffir or the Chinaman. The 'Cape boy' is a fairly hard worker, but as a rule he is rather a drunken rowdy specimen of humanity; the employment of him will certainly not solve our labor difficulty. The total number of coolies on the Rand on August 31, 1906, was 52,079. It is satisfactory to note that there have been no outrages committed by Chinese for some time past. It is probable that most of the bad characters have been weeded out. In a year's time the contracts of the coolies will begin to expire. One cannot help wondering what will happen then. Take away the 52,079 Chinamen now at work, and the mines will be in a bad way. The failure of the 'Cape boy' experiment, and of the free recruiting for Kaffir labor, should prove to everyone the necessity of Chinese labor.

The boom in diamond prospects continues. How long it will last, it is hard to say. If the numerous diamond syndicates collapse, it is probable the gold shares will be affected also.

Salt Lake, Utah.

New Companies Organized.—Big Orebody In the Cactus.—Deep Creek District Reviving.—The Ontario Adit.—Shipments From Tintic.—Increased Local Activity.

The shareholders of the Big Cottonwood Copper & Gold Mining Co., operating in the Big Cottonwood district, near Alta, have authorized an increase of capital stock from 300,000 to 750,000 shares of $5 each. N. Treweek, of Salt Lake, is president. —— The organization of the South Columbus Con. has been effected. This company



Map of South Africa.

has secured control of the South Columbus and Alta Quincy mines at Alta, and it is the intention to operate upon an extensive scale. —— Shareholders of the Silver Bell Mining Co., operating at Park City, have authorized an increase in the capital stock from 250,000 to 750,000 shares; the entire increase, including 25,000 shares of old company stock unissued is to go into the treasury. ——Articles of incorporation of the Surprise Mining Co., to operate in American Fork district, have been filed. C. W. Earl, of American Fork, is president. —— The Weber County Mining & Milling Co. has been formed at Ogden, with Albert Scocroft as president.

Samuel Newhouse, operating the Cactus mine in Beaver county, has announced that the capacity of the mill now in commission is to be doubled within the next four months and that eventually it will be doubled again. The plant is now treating 800 tons of ore per day. The improvements are to be made in consequence of the development recently of a tremendously large orebody. Mr. Newhouse says that on the 500-ft. level where the orebody has been cross-cut for 285 ft., it will average between 2 and 2½% copper and on the 600 the assays are even better, the copper having increased from 2 to 4% with more gold and silver also.——At a depth of 235 ft., in the Talisman mine in Beaver county a body of lead-silver ore has been encountered. The property is near the Cedar mine and the ore is identical.

There is unusual activity being displayed now in the Deep Creek mining district west of Salt Lake and it seems certain that at least one railroad will penetrate that

region next year. A local syndicate has formed the Utah & Nevada Railroad Co., which has been projected to run in a direct route to Ely, Nev., from Salt Lake. The Western Pacific can get into Gold Hill, the nearest of the Deep Creek camps, from its main line by building a branch line about 30 miles long. The San Pedro, Los Angeles & Salt Lake is also looking into this territory. The Gold Hill mine, owned by the Western Utah Copper Co., is said to have developed into a big thing and is to be operated upon an extensive scale. F. Augustus Heinze and officials of the Bingham Consolidated Mining & Smelting Co., are in control of this enterprise.

The management of the Ontario mine at Park City has every confidence that the drainage adit will be opened again in the near future. The drill-holes, run from a parallel drift, have apparently tapped the main channel and the water is being drawn off through them. The opening of the adit again will mean resumption of development and ore extraction from the lower levels of several of the big mines again.——The management of the Consolidated Flagstaff has made another payment of $20,000 to the original owners of the property operated by that company at Alta. ——The management of the New Stockton mine, at Stockton, will shortly begin sinking below the 1,000-ft. level. Some extensive bodies of ore were opened on this level recently. An aerial tramway will be built early next year, and the capacity of the mill is to be doubled right away. J. J. Trenam, of Salt Lake, is manager.

The ore shipments from the Tintic mining district last week were 136 carloads, the shipping mines and respective amounts being: Ajax, 4; Centennial Eureka, 42; Beck Tunnel, 5; Bullion Beck, 4; Carisa, 6; Eagle & Blue Bell, 9; Eureka Hill, 7; Gemini, 11; Grand Central, 6; Mammoth, 18; Swansea, 3; Scranton, 3; Dragon, 7; Uncle Sam, 3; Victoria, 4; Yankee Con., 4 carloads.——The management of the Carisa mine, in the Tintic district, reports the development of a large body of good shipping ore on the 300-ft. level. It has been cross-cut for 25 ft. Shipments have been made showing 10% copper, 30 oz. silver, and $8 in gold.

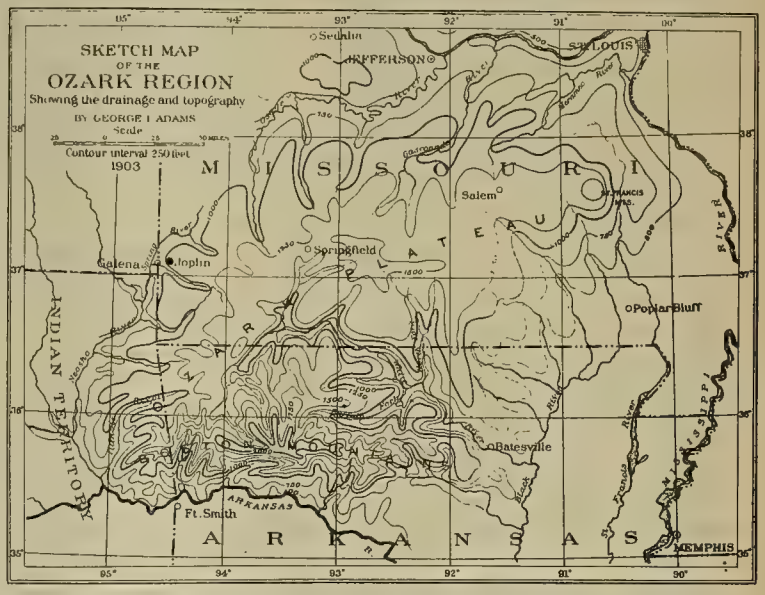
Good weather has aided progress in the construction of the concentration mills being erected at Garfield by the Utah Copper and Boston Con. mining companies.—— October was a record-breaker in the way of ore and bullion settlements in Salt Lake, the totals reaching $3,567,600, or nearly $1,000,000 more than the showing made in September.

Joplin, Missouri.

High Prices for Lead and Zinc Ore.—Big Output From the Joplin District.—Several New Discoveries.

The highest price reported paid for zinc ore last week was $48 per ton, on an assay, basis price of $42 to $45 per ton of 60% zinc. This is a rise of $2 per ton over the previous week, both in top price and in the assay basis. The advance was caused by the Mineral Point Zinc Co.'s buyer having instructions to increase his purchases and he was compelled to raise the price in order to get the ore. The highest price reported paid for lead ore was $83.50 per ton, a decrease of 50c. per ton over the previous week, but the market continues firm and there is no likelihood of lead going below $80 for some time to come. The shipment of zinc ore was the second largest of the year, the second week in May this year being the largest in the history of mining in this region; the value was also the second largest in local history. The shipment last week was: Zinc ore, 13,970,630 lb., valued at $295,884; lead ore, 1,690,740 lb., valued at $67,540; combined value, $363,424. Compared with the same week last year the zinc shipment showed an increase ot 4,111,280 lb.; and in lead there was an increase of 296,090 lb.; with a combined increase in value of $92,794. The shipments for the 43 weeks of this year are: Zinc ore, 458,011,300 lb., valued at $9,887,591; lead ore, 64,526,770 lb., valued at $2,482,242; combined value, $12,369,833. This is an increase over last year for the same number of weeks of 41,497,850 lb. zinc and 12,921,260 lb. lead ore and an increase in value of $1,514,908.

The general outlook in the Joplin mining district was never better, and the year 1906 will go down in history as the greatest on record, but with the great amount of prospect work now going on and the many new pieces of land being opened up every day, and the many new mills that are being built, the year 1907 will be still larger.



Oscar and E. M. DeGraff, of Joplin, have a lease on 180 acres of the Brooks land, five miles northwest of Joplin, and report that they find it rich in ore. They put down 13 drill-holes and were successful in finding ore in seven of them. Having sunk shafts on two of these holes and encountered a rich body of ore, they have now cut a drift from one shaft to the other and are in splendid shape for carrying on the work. Some large returns will be made from this land in the near future.——The Mercedes Mining Co., of Joplin, has filed articles of association, with a capital stock of 100,000, in $1 shares, all subscribed and paid in, for a term of 50 years. The stock is held by John R. Holmes, John H. Cape, C. M. Sheldon, all of Joplin, and I. C. Hess of Carterville. The company has a lease on 16 acres of the Center Creek lease at Webb City, to which place they are moving a mill from one of their Chitwood properties. There has been a large amount of ore taken out of the ground which they have leased, at shallow depth, but they are going to sink for the sheet run of ore now known to exist on the Center Creek lease, and in a short while they will be making a regular weekly output.——Burt W. Lyon, of Joplin, and John W. Durby, of Webb City, who recently began drilling on

their 10-acre lease just east of the famous Lucky Budge mine, on the Aylor land at Prosperity, have succeeded in finding ore at a depth of 167 ft., the drill cutting a body of rich zinc ore and some lead.

Butte, Montana.

October Production.—Important Statistics.—The Snow Storm Mine in the Coeur d'Alene.—Timbering the West Colusa Shaft.—Ore Cut in the Pollock.—Snowhomish and Tramway to Be Worked.—Montana Zinc Co.—Talk of a Merger.—Butte Copper Co. Strikes Good Ore.

The Butte district produced 28,893,240 lb. copper in October. Some of the big producing mines are still closed. The different companies contributed as follows:

Company.	Tons of Ore.	Pounds of Copper.
Boston & Montana	93,000	7,161,000
Anaconda	105,400	7,694,200
Butte & Boston	18,600	1,302,000
Washoe	17,050	1,176,450
Parrot	11,470	711,140
Trenton	16,275	1,139,250
North Butte	34,100	4,092,000
Butte Coalition	28,675	2,064,600
Original	26,350	1,844,500
East Butte	6,200	558,000
Pittsburgh & Montana	4,340	390,600
Miscellaneous	10,850	759,500
Total	372,310	28,893,240

The daily output of ore and the average yield per ton in copper were:

Company.	Tons per Day.	Pounds per Ton.
Boston & Montana	3,000	77
Anaconda	3,400	73
Butte & Boston	600	70
Washoe	550	69
Parrot	370	62
Trenton	525	70
North Butte	1,100	120
Butte Coalition	925	72
Original	850	70
East Butte	200	90
Pittsburgh & Montana	140	90
Miscellaneous	350	70
Total	12,010	

There is much local interest in the Snow Storm mine in the Cœur d'Alene district of Idaho. Several engineers from Butte, some of them employees of the Amalgamated, have lately visited the mine, and on their own behalf have purchased stock in the enterprise, the shares being worth in the neighborhood of $3.40. Many inquiries concerning the mine have been received here from financiers in Boston and New York. According to the reports of some of the experts, there is more than 2,000,000, perhaps as much as 5,000,000, tons of first-class copper ore blocked out. This immense body of ore can be extracted, owing to the adits reaching the stopes, at a cost of about $1 per ton, which is $2 less than the average cost of extracting ore in the large mines of Butte. The vein has been opened to a depth of 1,500 ft., three adits having been driven into the mountain. The faces of all the drifts are in pay-ore. The vein is 125 ft. wide at the lowest level, and has been opened at that point for about 800 ft. Between adits No. 2 and 3 the vein is 60 ft. wide and assays from 10 to 30% copper. The rest of the mine shows assays averaging about 4%. The richest copper ore carries 7 oz. silver per ton besides the copper. On the lowest level the ore does not run as high in copper, but the experts are inclined to believe that this is largely due to leaching by the water, which flows through the vein matter in great quantities on that level. It is thought probable that the water has carried the copper away and deposited it deeper in the vein as copper glance. In anticipation of this being found true a fourth adit is being driven farther down the mountain, to tap the vein at a depth of 2,000 ft. W. D. Greenough of Spokane and his associates control this property, as well as the adjoining claims of the Snow Shoe group, which will be opened up in the near future from the workings of the Snow Storm. Last month the Snow Storm Co. distributed $90,000 in dividends, and the manager is confident that when the concentrating plant is running, the dividends will amount to $1,000,000 per year.

Re-timbering of the West Colusa shaft has been completed, and the mine is again in operation, sinking being prosecuted with a view to carrying the shaft down to the 2,000-ft. level immediately, or 400 ft. deeper than it is now. With this mine running at full blast, the Coalition will be hoisting in the neighborhood of 5,000 tons of ore per day, which is about 1,500 tons more than the Great Falls smelter can handle. The surplus will be sent to the Washoe, at Anaconda.——The Pollock mine, belonging to the Butte-Milwaukee Co., which is under the control of the Butte & New York Co., has cut the vein at a depth of 250 ft., and has not reached the hanging wall of the vein. The ore runs high in silver.——One of the new companies holding claims east of the Boston & Montana mines on the flat, is the Colusa-Leonard Extension Co., which was organized only this summer, and has already begun sinking a shaft. The promoters hope to strike the productive veins of the Leonard and West Colusa mines where they extend under the flat. A small hoist will serve until the 500-ft. level is reached, when a larger plant will be erected. The four claims held by the company comprise 45 acres.

The Snohomish and Tramway claims, which belong partly to the Butte & Boston and partly to the Butte Coalition, have not been worked for the past four years, owing to the injunction secured at that time by F. A. Heinze. As soon as the shaft is completed, these mines will be worked for the two companies, and the Minnie Healey mine, of the Coalition, will also be worked from the same shaft. This will be a convenience to the Coalition, as the Minnie Healey shaft is a notoriously bad one, being sunk in soft ground, which necessitates constant repairing. The Tramway shaft has reached the 500-ft. level, and is being raised from the 1,000-ft. level, so that this part of the shaft will soon be completed. Sinking and raising will be continued until the shaft reaches the lower levels of the Minnie Healey.——Work will soon be commenced by the new Consolidated Central Butte Copper Mining Co., which owns ground near the South Butte Co., the holding company for the interests of the Great Northern railroad in this city. The company has interests in property east and west of the Ophir mine, of the Butte Central & Boston Co., besides that lying farther to the east.

In connection with the bankruptcy of the Montana Zinc Co., which owned the Alice mill, burnt last summer, there has come to light a transaction that appears on the face of it to implicate F. Augustus Heinze, or his representatives in the State Savings Bank of this city. Robert C. Morris, the receiver appointed for the company, came to Butte last August, and found among the assets of the company a block of 7,500 shares of stock of the Alice Silver & Gold Mining Co., which was deposited in the State Savings Bank as collateral for a note for $10,000. The stock has a market value of something like $50,000. Mr. Morris claims that he tendered the face value of the note with interest in August, the note being due last month, and that the officials of the bank refused to produce the stock and cancel the note. He has commenced action looking to the examination of the books of the bank, alleging that the stock is being concealed by the officials, including F. Augustus Heinze, who is not at present in the State.——There is some talk of a merger of

the affairs of the Montana Zinc Co. with the Butte Copper & Zinc Co., which owns the Emma mine in South Butte. It is supposed that the latter company will begin work on that mine in the near future. The Montana Zinc Co. is waiting in the meantime for the settlement of its entangled financial affairs.

The Butte Copper Co. has cut the large vein of the Trifle claim in its shaft at a depth of 378 ft. The vein was cut by a cross-cut at the 300-ft. level, but it is double in width at the point where it has now been cut, and assays about 4% copper with some silver and gold. The vein is said to be the same as that worked by the Gagnon mine.——The Six O'clock shaft, sinking on the group of claims east of the city, belonging to the Butte Exploration Co., has reached the 1,000-ft. level, and the station is being cut, preparatory to cross-cutting north to the vein. If nothing of value is found, sinking will be resumed.

Calumet, Michigan.

Good Progress at the Hancock Con.—Sinking in the Medora.—Explorations on the Empire Tract.—Activity at the Extremity of the Keweenaw Peninsula.—Improvements at the Osceola and the Wolverine—Osceola Pushing Production.

Steady progress is being made in unwatering the old shaft on the property of the Hancock Consolidated Mining Co., adjoining the Quincy mine on the southwest, and the next few days will see the completion of the work. As soon as the workings can be put in shape, drift-stoping will be started, and shipments to a stamp-mill are expected to follow immediately. This policy of early shipments is characteristic of all mines that are controlled by Thomas F. Cole, of Duluth; John D. Ryan, of Butte, and Capt. James Hoatson, of Calumet. It is only a few months since the Hancock Con. was organized by these interests and by the St. Mary's Mineral Land Co., which owns a one-fifth equity. But the old Hancock mine, which forms a small portion of the Hancock Con., was worked many years ago, when it produced 5,000,000 lb. refined copper. Its old shaft is 1,000 ft. deep, and as this will be unwatered in a few days, it can be made a producer of no mean importance. Therefore, because of the present high price of copper, great advantage will accrue to the company.

At a depth of 150 ft. on its Medora mine, in Keneenaw county, the Keweenaw Copper Co., in which the Cole-Hoatson-Ryan interests have a heavy investment, the showing of copper is excellent. Sinking has penetrated exceptionally rich rock for the last 50 ft. and the copper showing is considered the richest on any of the company's properties. Work will progress much more rapidly henceforth, as the steam-power plant has gone into commission. The plant consists of boiler, compressor, and hoisting engine. Previously drilling was done by hand, but henceforth power-drills will be used and sinking will therefore progress much faster. Three drills are used in sinking the shaft. The compressor has a capacity for 10 or 12 drills and it is planned to cut a station at the 200-ft. level and start drifts east and west from the shaft. Hoisting in the Medora shaft has been facilitated by the installation of a two and one-half ton skip. A good-sized stock pile is being accumulated and will be shipped as soon as arrangements are made for the treatment of the ore. All of the improvements are of a substantial character and designed for service throughout the development period.

Diamond-drill exploratory work on the Empire tract of the Keweenaw Copper Co. is progressing rapidly. It is expected that the drill will intercept the Medora vein in a few days. In the event of satisfactory drill cores, one or two shafts will be started on that property. The Medora vein was uncovered on the Empire property in a trench some time ago, and good copper ore was revealed. The width of the lode at surface is 12 ft. The Empire is nearly two and a half miles east of the Medora shaft, on the same lode, and thus a long stretch of the company's territory is demonstrated to be well mineralized. Reports are current that negotiations are in progress relative to the Clark mine, near the extreme point of the Keweenaw peninsula, but nothing definite is known regarding the deal. Nearly all the Keweenaw county mineral lands of promise, not held by corporations, are quietly being optioned.

Sinking in the Tecumseh's shaft has been suspended at the ninth level and will not be resumed until production is well under way. At each level, drifts have been started. These will now be extended as drift-stopes, which will furnish the rock for shipment to the stamp-mill. The Tecumseh's production will be limited to about 100 tons of ore daily for some time to come.——Preparations for important improvements are under way at the old Osceola branch of the Osceola Consolidated Mining Co.'s property. A new Nordberg compressor and an entirely new boiler-plant will be installed. The foundation for the boiler-house is being laid. The superstructure will be of steel furnished by the Wisconsin Bridge & Iron Co., of Milwaukee, Wis. There will be five boilers of the locomotive fire-box type from the Pratt boiler works, at Detroit, and the Burt boiler works, at Ripley. When this plant is finished, the old boilers will be torn out of the stone building in which they are housed and the structure will be converted to the use of the new compressor. A 75-h.p. electrical equipment will also be installed in this building.——Work on the new Nordberg conical-drum, duplex-hoisting engine at the Wolverine mine is progressing rapidly. The new engine will have a capacity for operating to a depth of 5,000 ft., carrying the shaft to the boundary line of the Wolverine property.

It is uncertain when operations will be resumed at the No. 1 shaft of the Osceola Consolidated Co.'s North Kearsarge mine. This shaft, which was injured recently by fire, is being re-timbered in the damaged portions as rapidly as possible, but the work has not reached the point where the fire originated. In the meantime, the force at No. 3, the other active shaft of the North Kearsarge branch, is working a greatly enlarged force. At the South Kearsarge and old Osceola branches of the Osceola Con., the production is being forced to the limit. There are two active shafts at each of those properties, and the increase in their shipments will tend to offset the loss through the inactivity at No. 1 North Kearsarge.

Plans have been made by the Mohawk Mining Co. for improvements at the No. 4 shaft. A new steel self-supporting smoke-stack will be erected, the contract having been let to the Wisconsin Bridge & Iron Co. A new Green fuel-economizer also will be installed at No. 4. These improvements will complete the heavy construction era for the Mohawk's four northerly shafts and provide the mine with permanent equipment for the remainder of its period of production. No. 5 shaft, the Mohawk's most southerly opening, is provided with a temporary equipment, but it will suffice during the shaft's development period.——Trenching has revealed the outcrop of a lode 20 ft. wide on the Arcadian property. The formation bears some resemblance to the Baltic lode. The cross-cut at the 200-ft. level of the new exploratory shaft was recently resumed, and it will be driven eastward until the formation exposed at surface is cut. The Arcadian has cut a number of cupriferous measures in its new exploratory shaft, but none of them revealed anything of exceptional promise, nor can the prospects be

considered inviting.——Within a short time the Calumet & Hecla will use electrical power for pumping water at its station on Lake Superior, five miles from Calumet. The pumping plant at that point furnishes all the water for domestic purposes at Calumet, Laurium, and Red Jacket. This water system is being extended to its stamp-mills at Lake Linden, where only artesian water for boiler and domestic purposes is now available. This is because the water in Torch lake is polluted by the sand discharged from the mills.

Toronto, Canada.

Prospecting Season Ends in Northern Ontario.—The Colonial Silver Mines.—News From Mines at Cobalt.—Monthly Returns to be Published.—Native Silver in Port Arthur.

The prospecting season in the Cobalt district and northern Ontario generally is now practically over, as snow has fallen in sufficient quantity to put a stop to operations in most localities. At the leading mines most of the shaft openings have been enclosed in preparation for the the winter, so that underground work will be pursued uninterruptedly.

The syndicate which recently secured the McLeod and Glendinning property, of which Charles B. Flynn, of New York, is a prominent member, has organized the Colonial Silver Mines, Ltd., and is buying other properties, having already secured 140 acres. Anson D. Cartwright, formerly with La Rose, is superintendent and has a force of 20 men at work. The company has ordered a complete plant, including a 300-h.p. air-compressor from the Rand-Jencks Co., and will increase the force to 200. A vein one foot wide was found last week, the ore of which is stated to run as high as 5,000 oz. silver per ton. It is claimed that in sinking the shaft, 300 ft. distant, a continuation of this vein was struck at a depth of five feet, having at this point a width of four feet of ore with five inches of pure silver in the middle of the vein. Ore from the mine is being sacked for shipment.

The syndicate which has purchased the Green-Meehan mine, two miles north of Cobalt, has appointed as superintendent Charles O'Connell, who has had a long experience in California and Nevada mining. Twenty-five men are now on the payroll and nine veins have been discovered and traced. A complete plant will be installed by Christmas.——The re-organization of the Foster-Cobalt Mining Co. has been completed, with W. K. George as president and W. H. Blake as vice-president. A first-class plant has been shipped to the mines.

The Right of Way mine is proving very productive. One ton of first-class ore has already been extracted, including a quantity of native silver.——The Red Rock mine has been sold to a Toronto syndicate, represented by E. A. Osler. Before the deal was finally put through the owners offered $30,000 to call it off, but the syndicate refused. A large quantity of ore is awaiting shipment.

La Rose Mining Co. has sold the refuse ore which has been accumulating in large quantities on the dump at $25 per ton, which will realize about $250,000. It will be shipped to Providence, R. I., for treatment.——At the Nancy Helen mine the shaft-house and other buildings are completed and about 25 men are steadily at work with two loads of high-grade ore ready for shipment. The company will shortly begin operations on another location in Bucke township.——At the Nipissing mine, the company is installing a mechanical sampler furnished by the Allis-Chalmers Co., by means of which the exact value of ore shipped can be ascertained. It is the first of these machines to be introduced in the Cobalt district.

The Temiskaming & Northern Ontario Railway Commission has recommended to the Government of Ontario the publication of monthly returns of the shipments of ore from Cobalt. It is probable that this system will be adopted. This will have a tendency to discourage speculation in non-productive mines.

The American Madoc Mining Co., which is working pyrites mines in Hungerford township, Hastings county, and at present employing over 40 men, is preparing to erect large chemical works for the manufacture of sulphuric acid. The staff will be increased to about 150.——At the West End Silver Mountain mine, in the Port Arthur district, now being operated under the management of Capt. Hanson, a vein of almost solid silver was struck on October 27. Samples of the ore, some of them of pure silver, one of which weighs 100 lb. and valued at $600, have been brought to Port Arthur. The vein was known before, but had been lost. A carload of the ore is being shipped to Omaha. Much of it is so rich that it is not passed through the stamps, but sent direct to the smelters. An adit is to be run from the West End mine to the Shuniah Weachu mine, over 2,000 ft., and it is anticipated that it will strike several veins.——The Three A, once a noted silver-producing mine, on Thunder bay, east of Port Arthur, which has laid idle for about 30 years, has been bought by New York capitalists. The price is given as $75,000. Operations will shortly be resumed.

Cripple Creek, Colorado.

Production in October.—A Good Showing.—The Midget Doing Well.—The Lucky Corner Strikes Ore.—Discoveries in the Index and in the Acacia. British-American Co. Does Well.—The Ophir Makes a Record.—General Activity Despite Snowstorms.

The October production of the Cripple Creek district shows a gain over that of September. The smelters, reduction plants, and cyanide mills treated approximately 42,800 tons of ore from the camp, valued at $1,570,300. This is a little over $100,000 better than September, which is satisfactory, considering that several of the mines are holding their ore in reserve for treatment by the cyanide mills now in course of erection, and that the recent heavy snowstorm impeded mining operations for nearly a week.——The Midget mine on Gold hill is making regular shipments. Operations are being conducted principally on the 900-ft. level, where the best ore is broken. The ore ships about $30 per ton. Adjoining the Midget is the Moon Anchor, where the Union Leasing Co. is doing exploratory work. The same leasing company has also taken hold of the south half of the Clara D. claim of the Lexington Co. It is proposed to extract the large body of low-grade ore recently encountered in the Lexington mine and which that company has been shipping to the Anaconda cyanide mill. Forty-five tons per day, running $6 per ton, is being treated.——A two years' lease has been granted to McLeod, Redford & Co. on the World's Fair claim of the Gold Bond Co. on Gold hill. Cross-cuts are being driven at 365 ft., with the object of reaching the World's Fair Pointer shoot, which produced so well in the Accident claim and in the upper levels of the World's Fair, formerly under lease to H. T. Anstie. Royalties range from 15 to 25 per cent.

The Lucky Corner Gold Mining & Tunnel Co., leasing on the middle block of the Little Clara claim of the Work company, has struck ore at a depth of 580 ft. in virgin ground. Operations are carried on through the Moffat tunnel at a distance of 5,000 ft. from the portal. Values and dimensions of the orebody are not to hand, but sylvanite has shown up in many places. The vein is thought to be an extension of that in the adjoining block, where Marsh, Hodges & Co. have one of the richest leases in the district.——Another find of ore has been made in the Index mine on Gold hill. The Aetna Mining & Leasing Co. is at present operating this property, William Foley being manager. The vein was encountered at a depth of 360 ft., and is said to be six feet wide, and as-

says have been obtained from it as high as 20 oz. per ton.——The Abe Lincoln mine of the Stratton Estate, in Poverty Gulch, has been shipping some high-grade ore recently. The Tunnel Mining & Leasing Co. is working this property, doing a considerable amount of development. A large quantity of medium-grade ore is on hand, which it is intended to ship to the Golden Cycle mill at Colorado City on the completion of that plant.

Hoisting has commenced on the Morning Glory No. 6, operated by L. G. Henry and associates. A vein two feet wide is being mined at a depth of 250 ft. near the shaft. The first shipment will be made in a few days.——The output of the Henry Adney mine on Beacon hill is averaging 400 tons monthly. The grade is said to be as high as $80 per ton, one car running nearly $200 per ton. It is proposed to install new machinery and increase the tonnage. M. B. Burke is owner and general manager.

The W. P. H. Leasing Co. has obtained a lease on the west half of the Teutonic claim of the Teutonic Consolidated Gold Mining Co., lying southwest of the present workings of the W. P. H. claim. Drifts are being advanced toward the side line of the Teutonic, one drift being already up to the line and another 40 ft. from it; both these will cut the Teutonic ground at a depth of a little over 300 ft. It is hoped that several veins that produced well in the upper part of the Teutonic ground, will be encountered at the lower level and be of as good grade. A. B. Whitemore is in charge of the company's interests.——A strike of ore has been reported in the old Burns shaft near the town of Altman, belonging to the Acacia Co. J. B. Neville and partners have this property under lease and obtained the ore at a depth of 360 ft. The vein is 6 in. wide, but said to be remarkably rich, free gold showing in many places. A carload will shortly be shipped.——One of the largest compressors in the district has just been installed by the Golden Cycle Co. at its property on Bull hill. It is an Ingersoll-Rand and has a capacity of 40 drills. A new building has been specially built to accommodate this machinery.——The British-American Mining Co, Ltd., leasing on the South Dante, on Bull hill, has done extremely well during the month of October in spite of the recent bad weather. For several days the road from the mouth of the Trail tunnel to the Eclipse switch on the Midland Terminal railroad was impassable. This company has shipped nine cars of ore during the last eleven days. The bulk ore is running a little over an ounce and the screenings 2½ oz. per ton. The filled-stope method of mining is being adopted, there being at the present time over 300 tons of broken ore in the stopes. Four machines are working on ore.——The October output of the Ophir mine on Raven hill will approximate $75,000 in value. An average of a car a day has been shipped from this property, every one of which has run better than 4 oz. per ton. This is a good record.

London.

An Onslaught on American Mines.— A Cobalt Flotation.— Queensland's Mineral Production.— Cyanide Practice in New Zealand.

The editor of a financial weekly, generally much occupied with Indian gold mining shares, has turned aside from that engrossing subject to warn the innocent British speculator against American mines. It might be imagined that such of these mines as have the advantage of an English directorate would escape censure, but no; for readers are reminded of the ruinous lawsuits brought against the Richmond Company and the Montana Company, and it is vaguely hinted that the same blow or something equally terrible may at any moment fall on other companies interested in mining property in America. This indiscriminate onslaught recalls the vivid contrast so beloved of moralists—the naughty boy who absented himself from Sunday school to trespass in his neighbor's orchards with the result that eventually he graduated for the gallows, with honors, while the good boy who attended regularly grew up to be Prime Minister of his country. Perhaps the most heinous offence of all in the editorial mind is that "the companies are registered under American law, and there is no guarantee that shareholders will have those regular reports which English companies are accustomed to issue, or that those meetings will be held at which directors are required to give an account of their stewardship." The privilege of showing up at public meetings to heckle directors or to make a speech to be reported at length in one's favorite journal is a prerogative highly cherished by certain speculators, the volume of whose 'investments,' as a rule, forms a striking contrast to the frequency of their appearance in pubiic.

A propos of big rivers in the vicinity of eligible town sites, and the providential provision of mineral wealth for Britain over the seas, Cobalt may be cited as a remarkable instance, which a new company, the Cobalt Townsite Silver Mining Co., Ltd., is preparing to turn to account. According to numerous press notices now appearing, the Company's property adjoins La Rose, the romantic pioneer of the district, and is even of more pronounced richness than this older mine. It is stated that a Government assay gives the value of its ore at $4,000 per ton, and there is an immense body of silver ore in sight. Intending investors are informed that the shares in this latter concern, the par value of which is £1, will shortly be introduced to the London market at a price of £2.

Regarding another part of the Empire, Queensland's mineral production in the past year is reported as of the value of £3,726,275, being the highest in the history of that State, and although the yield of gold decreased, the sustained improvement in the production of other minerals more than compensated for it. The high prices prevailing for most minerals other than gold greatly stimulated production. An improvement is also visible in the production of coal, owing largely to the liberal concession made by the Government in foregoing part of the port dues on vessels loading 500 tons or over for bunker purposes. The development likely to take place on the Etheridge, Cloncurry, Mount Morgan, Glassford Creek, Mount Cannindah, and other mining centres points to such increased production that the value of Queensland's output of minerals this year is expected to surpass even that of last year.

From New Zealand some new experience is gained in the milling operations of Waihi Junction, recently started. It would appear that the production of slime is excessive and consequently more filter plant (Moore system) is required. From August 20 to October 6 twenty stamps ran 24 days, and crushed 2,800 tons; average value of ore, £2 7s. 0d. per ton; estimated extraction 80%, equal to £5,300; bullion shipped £2,200; remaining in plates and boxes £3,100. Duty per stamp 5.83 tons per day. It was originally estimated that the stamps would crush about four tons per day, and the necessary plant for treating the resulting slime was provided on this basis, under the best expert advice. It has been found that not only is the efficiency of the stamps greater by nearly 50%, but a far larger proportion of the ore is reduced to slime than was anticipated. In consequence of this increased production of slime, milling operations have been interrupted and curtailed. When it became apparent that the filter-presses were inadequate to deal with the large quantity of slime formed, steps were immediately taken to provide the additional plant required.

Mining Summary.

ALASKA.

A discovery of gold has lately been made on North river, a tributary of the Unalaklette. While good prospects have been found on the river and its smaller tributaries no defined body of pay has yet been found. No work has been done to speak of other than sinking a few shallow holes, none of which has yet been put to bedrock. This is a well mineralized section and may develop into another large producing district.——The grading crew on the Wild Goose Co.'s pipe-line from Pilgrim river to Nome have been laid off, but the pipe-laying crew are rushing operations as rapidly as the conditions will permit. It is the intention of the company to lay all the pipe that is at present on the ground before the close of navigation. During the coming winter several miles of pipe will be hauled to different points along the line, and will be connected next spring. The line when completed will have a capacity of about 4,000 miners' inches.

ARIZONA.

GILA COUNTY.

(Special Correspondence).—The Live Oak Copper Co., at Globe, is working a considerable force sinking an incline-shaft and preparing for the installation of a hoist and air-compressor. The shaft is down over 100 ft. and is bottomed in 9% ore. The mine has one of the largest bodies of silicious copper ore of good grade in the district; it produced $100,000 when worked by Boom & Strang, lessees, and was lost by the caving in of the workings. The new shaft is being sunk for the purpose of re-opening this orebody and to re-establish the Live Oak as a productive mine.——The Globe Consolidated is working a large force of men at the Gem shaft; the number will be increased as rapidly as conditions will permit. The shaft is down 88 ft. and the first set of timbers is being put in. After the work at the shaft is well under way it is expected that the company will gradually expand operations.——Water has been struck at 558 ft. in the Black Hawk shaft, and the flow has increased until work had to be suspended. A pump will be installed soon, when the management expects to be able to sink 800 ft. and open another level. Aside from the suspension of work in the Black Hawk shaft, caused by an unexpected volume of water, the Arizona Commercial Co. has made good progress of late. The cross-cut at the eighth level has now been driven 300 ft. and is in an altered lime, which is considered a favorable formation for the occurrence of ore. The grade for the standard-guage railroad which is to connect the company's mines with the Old Dominion smelter is completed. Several cars of bridge timbers are being unloaded where needed.——The Keystone Copper Co. is shipping 20 tons of 12 to 15% ore per day to the Old Dominion smelter, and expects soon to increase shipments to 75 or 100 tons daily. It is working a force of 50 men. The mine is looking well and the stopes showing steady improvement.——The Inspiration Mining Co. is busy moving machinery and grading for its concentrating mill, and progress is good.

Phœnix, November 5.

PINAL COUNTY.

It is reported that the Lake Superior & Arizona Copper Co. will construct a railroad from Florence to Superior, and erect on the river near the Florence depot a 250-ton smelting plant. Mr. Sieboth, the general manager, will so plan the initial plant that its capacity can be doubled by a simple addition of furnaces, and as the company will treat custom ore with its own ore, it will not be long till a doubling of the furnace capacity will be necessary. The Superior mine alone is capable, with its present development, of keeping a 250-ton plant busy, and two years hence a 500-ton plant will hardly meet its requirements. Surrounding Superior and all along the proposed railroad down to within 12 miles of Florence are numerous mines, capable of large production, and the moment the railroad shall have been completed and the reduction plant placed in operation, ore shipments will commence from all these mines, and the same will be true of the mines along the Gila river from Florence to Christmas, including the Butte, Kelvin, Riverside, Ray, Mineral Creek, Troy, Ripsey, Banner, Bunker Hill, and Mammoth districts. The most distant of these districts is only 25 miles from the proposed smelter site at Florence, and are reached by the Phœnix & Eastern railroad.

CALIFORNIA

INYO COUNTY.

The Iron Mask group of 16 copper claims, situated 17 miles southeast of Greenwater, has been sold to the Pittsburg & Greenwater Copper Co. for $200,000. Mr. McGarry is general manager.

SAN BERNARDINO COUNTY.

Another discovery of large copper deposits is reported in the Silver Lake region, 50 miles from Ludlow. A number of prospectors are heading for this district and also to Coma, where a find of native silver deposits is reported.

Contractors on the Tonopah & Tidewater railroad are experiencing great difficulty with their employees in the Amargosa cañon. The excitement over copper discoveries is so great that the laborers are leaving in large parties to indulge in the luxuries of a rush to the new camps.

SAN DIEGO COUNTY.

Kuntzite has been found at Pala. The discovery was made in a copper prospect, and about 15 lb. of this gem stone was taken from a pocket. Kuntzite is a beautiful variety of spodumene of considerable value.

SHASTA COUNTY.

Developments in the Mammoth mine are proving the orebody to be of enormous extent, and the life of the mine is proved to be more than ten years, and it is more than probable that the exploration now under way will double or treble this estimate. Diamond-drills are proving new ground and valuable discoveries have been made. The company has also acquired valuable holdings, with large croppings in the neighborhood of the Mammoth mine. Engineers are also scouring the northern part of the State to find new deposits. At the smelter new bins have been completed to increase the storage capacity for sulphide ores, as the aerial tramway has caused so much trouble by accident aud delays that the smelter has been in serious danger of a partial shut-down on several occasions. It has been decided to add two blast-furnaces, two converter stands, and an electric crane to the present equipment. The new furnaces will be 180 by 50 in. at the tuyeres, each having a normal capacity of 400 tons per day.——A very high capacity, about 25% above normal, has been maintained at Kennett lately. Under the management of H. S. Haskell, who did so much in the development of pyritic smelting at Keswick, the percentage of coke has been greatly reduced, and the capacity of the furnaces increased as a natural result.——At the Balakalala mine development is proceeding, especially at Windy camp, which is about a mile north of the Balakalala, but no quantity of ore will be extracted until the tramway to Coram is completed.

TRINITY COUNTY.

The La Grange Co. has bonded numerous properties on New river and will work on a still larger scale.——The Noble and McAfee properties have been purchased by Dr. Williams.——At the Bear Tooth mine a mill is in operation, and hydraulic mining will also be commenced on an adjacent property.

COLORADO.

MINERAL COUNTY.

George D. Nickle of Del Norte who has been receiver for the Ridge mine for the past eleven years, has sold it to Pittsburg parties who will start work on a large scale. It is understood that Mr. Nickle was able to pay about 90c. on the dollar.

PARK COUNTY.

John Kuhn, manager of the London mine, is sinking a winze 150 ft. on the vein. If the ore continues in this winze arrangements will be made to drive a lower adit which will tap the vein something like 700 ft. below the present level. It is estimated that the adit will be 4,500 ft. long and will require two years to complete. There is also some talk of an electric road being built from the London mine to connect

with the C. & S. railroad at Alma. There is already a spur for some distance up the gulch, but is not in service at present.

SUMMIT COUNTY.

(Special Correspondence).—The Victoria mine has been taken over from the Masontown Mining & Milling Co. by G. D. Hibbs, who intends to develop the property and work the large sulphide orebodies. The main shaft will be sunk to the depth of 200 ft., and a hoist and pump installed. A tunnel will be driven at the bottom of the Mt. Royal, about 800 ft. long, and will cut the lode at sufficient depth to give nearly 1,000 ft. of stoping ground. In all probability the mill on the property will soon be put in action again.——About a mile and a half west of the Square Deal property, in the north Ten Mile cañon, a good gold vein has been discovered by two local miners, who have taken up a group of claims and formed a local syndicate to open up their discovery. Samples from the outcrop gave returns of $6, $8, and $10 per ton, and after the location work had been done, a 12-ft. vein gave an assay of $12 for the entire width. The nature of the ore is different from anything else surrounding it and appears to be the making of a free-milling gold proposition. ——An important strike has been made on the Kitty Innes by the lessee, George Berry. In driving the lowest tunnel into Peak 1, a vein was discovered which carries 4 ft. of solid ore, the majority of which is chalcopyrite of a good grade, which will return from $80 to $90 per ton. ——The lessees on the Juno are doing well and making regular shipments of a good grade of ore.

Breckenridge, Nov. 3.

IDAHO.

CUSTER COUNTY.

The smelter of the Lost Packer mine, at Ivers, Idaho, which was put out of commission by an accident only a few hours after being started, will not be started again until spring, owing to the deep snows making winter work impracticable.

NEVADA.

ESMERALDA COUNTY.

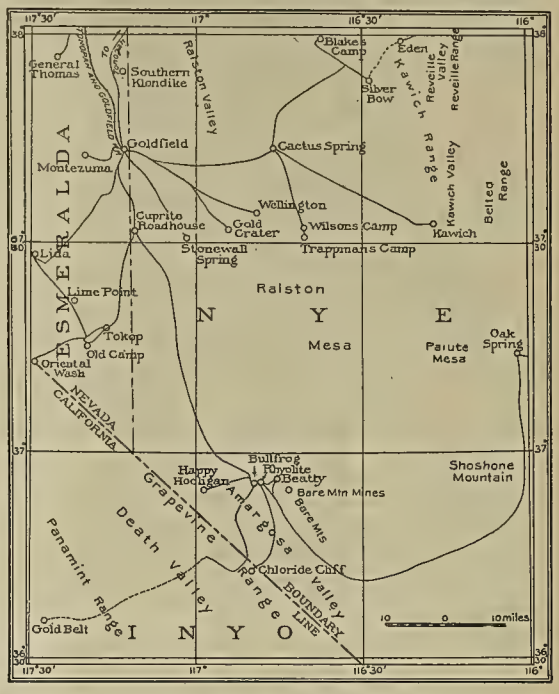
The Florence Leasing & Mining Co., operating the Lindsay lease on the Florence next to the famous Reilly lease, has opened up ore in several places on the lease. At present only one stope, on a six-foot vein giving high assays, is being worked owing to inadequate hoisting facilities. The new hoisting plant has arrived, however, and is now being installed. The shaft, which is now down 275 ft., will immediately be lowered another hundred feet.

HUMBOLDT COUNTY.

Lessees at the new discovered Cleghorn lode, at Seven Troughs, are finding good shipping ores at slight depths. Water is being piped from a strong spring 2,000 ft. above the new strike. The workings are at present less than 50 ft. deep.

LINCOLN COUNTY.

(Special Correspondence).—The railroad grading camp has been moved to within four miles of Searchlight and the work is progressing with more speed than heretofore owing to the cool weather and the fact that the contractors are able to secure more labor. The Manville stage running along this line will soon be discontinued as local bus lines can handle the passenger and express business at less cost and more convenience to the public. Lots have been platted and a site selected for the station house on the Boulder group of claims adjoining the Cyrus Noble property.——Henry B. Adsit, manager of the Colorado Mining & Milling Co., is down 240 ft. in his double-compartment shaft.——At Camp Thurman near Newberry mountain a townsite is being formed by B. S. Nagle of Butte, Montana. He has located eight claims and reports that he has shipped two sacks of ore to Los Angeles as samples, which show exceptionally high values.——Ernest G. Locke, a mining engineer from Seattle has bought the Golden Rod group of claims lying 1½ miles from Searchlight for $10,000. There is a remarkably good showing on assays taken from samples on this property. The vein croppings extend the entire length of the three claims. Several shafts have been commenced, the deepest being about 50 ft. A contract has been let for 200 ft. more work which will commence at once.——The Newberry Mountain district proper is attracting wide attention. Many prospectors, mining engineers, and curiosity seekers take in this territory when visiting Searchlight and a large number of claims have been located. Reports are very favorable and numerous outfits have been made up here bound for that district.——The owners of the Gold Dyke have arranged with contractors for the continuation of their 103-ft. shaft. Considering the small amount of development work done on this property, the showings are remarkably good and it is generally considered that the mine has a great future.——Artesian wells are to be sunk in Searchlight for irrigation purposes. The soil here is exceedingly fertile and where experiments have been made with irrigating such as was done on a large garden plot on the Pompeii property, the best possible results have been obtained. The so-called desert is doomed as far as this particular locality is concerned. Work on these wells will be commenced immediately with competent engineers in charge.——A good showing has been made on the Sunday Morning group of claims a mile north of the original strike at Trull springs. This property is owned by E. P. Trull, L. M. Stepp, and A. B. Brock. They will commence development work in the course of ten days.



Part of Nevada.

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Searchlight, Nov. 2.

LYON COUNTY.

The Nevada Douglas mine, at Yerington, has reached sulphide ore in the bottom of its double shaft, assaying 21.5% copper. This shaft has been in a carbonate ore all the way down.——The Sunlight shaft, in another part of the property, is also coming into sulphide ore.——The Blue Jay is not shipping now, but has been a heavy shipper. The property adjoining it on the south is that of the Yerington Co.; that next south of this is the Copper Mountain.—— The Mason Valley, in its upper working, has driven a shaft 105 ft. deep and at a distance of 75 ft. on the incline shaft it cross-cut the orebody, 115 ft. in width, the shaft being all in ore averaging about 5% of copper sulphides. It started a tunnel lower down at the base of the hill and expected to drive in 600 ft. before reaching the orebody, but at 450 ft. ore was encountered in the foot-wall, through which they have 50 ft. with no indications of its giving out. This ore averages about 3% copper.

NYE COUNTY.

(Special Correspondence).—Mining development in and around the town of Central, two miles west of Manhattan, is rapidly bringing that district to the front. More miners

are employed on the property of the Manhattan Nevada Gold Mines Co., owning the Georgey and El Dorado groups, than on any other one property in the district. The adit on the Georgey group is in the hill 250 ft. and three large veins have already been tapped, while on the surface, others have been opened by shafts and cuts, all of which will be cut by the adit in the near future. Vein No. 3 is 22 ft. wide, and strong, crossing the formation at right angles, and will intersect all other veins in the hill. This large vein could all be run through a mill at a profit.——The Manhattan Giant, to the north and adjoining the Georgey group, have erected a hoist which is now in operation, hoisting high-grade milling ore from a strong four-foot vein. Six men are employed on this property.——The Original Manhattan Mines Co., between the Giant and El Dorado, have gold, silver, and lead ores in large quantities. A hoist is on the ground and will soon be erected and in operation. Several tons of high-grade ore have already been shipped from this property, netting the company a handsome profit.——The Manhattan Nemo Mining Co., to the west and adjoining the Georgey group, have large quantities of lead and silver ore in one of their veins, and a high-grade streak of gold ore in another. Extensive development work is being carried on.——The Independence, Houligan, and Paymaster properties, a mile northwest of Central, are all working in high-grade milling ore, and several sacks of high-grade ore are to be found on the dumps, awaiting shipment.——In Manhattan, the sensation of the week is the strike made at the 200-ft. level on the Manhattan Con., where rich ore is being taken out and sacked.——The adit on the Manhattan Mother Lode Mining Co., is being pushed forward rapidly, now being in the hill 175 ft. Five veins have been crossed, all carrying good milling values, and driving will soon be started to block out these orebodies. Leads have been opened on the surface, carrying high values, and the tunnel is being driven ahead to encounter these veins at depth.——The cross-cut from the 90-ft. level in the shaft of the Manhattan Cowboy Mining Co. is in 125 ft., and the dolomite, through which they have been driving, is now being left behind, and good vein matter coming in.——The shaft on the Manhattan Express Mining Co. is progressing rapidly, and the lava flow which covers the surface has been pierced, disclosing a most favorable formation. Cross-cutting will be started a few feet deeper, to discover various veins carrying values that have been traced into the Express Co.'s holdings.

Manhattan, Nov. 4.

WASHOE COUNTY.

Development work on the Rocky Hill group of claims, situate 15 miles south of Reno, on the V. & T. railroad, is proving a series of parallel veins carrying about $16 in gold.

WHITE PINE COUNTY.

At the Success mine, where a big strike was recently made, a great deal of work is now being done. Two 150-ft. shafts have been sunk upon the property, and at that depth air connections have been made between the shafts. A continuous orebody has been found to a depth of 175 ft., which is as far as development work has gone. The ore vein is from 8 to 25 ft. in width, and the ore is rich in lead, silver, and gold. Two 85-h.p. boilers have been set up on the Success property, and a compressor plant is being installed. A sawmill, to be used in cutting timber for the mine, is also being put in. Abundant water is being procured from a spring above the property, 4,000 ft. of pipe having been laid to carry the water from the spring to where it is needed. ——The Duck Creek lead belt extends about 15 miles to the north of the Success mine, and in that area a number of new strikes have been reported during the past few days. At the Ely-Homestake No. 1 mine a vein 20 ft. wide of heavy galena was encountered at a depth of 20 ft. The mine promises to be a good producer of shipping ore.——A shaft 40 ft. deep has been sunk upon the property of El Gibraltar, and a splendid mineral showing has been made by the development work. All of the big Duck Creek mines are now ready to ship ore, and that district will be a busy one during the winter.——At the Cumberland-Ely the rich ore recently discovered in the Veteran workings is improving in quality and shows no signs of decreasing.

OREGON.

BAKER COUNTY.

At the Cornucopia mine 100 men are employed on this property and a 20-stamp mill runs continuously. Pierre Humbert is the consulting engineer and Valentine G. Laubenheimer general manager. The company has completed surveys for a railway from the mine to Hathaway, to connect, at present with freight teams from Baker City and, ultimately, with a line of road from Baker City to Snake river. At this mine driving is in progress on three veins, one of which is 16 ft. between walls, and is all milling ore. The development work pays for itself without stoping and yields an income, besides, to an amount estimated at $50,000 per month.——The Queen of the West Mines Co. is at work on a property adjacent to the one owned by Mr. Searles. Development work has been going forward on this property for three years but it is only recently that its equipment was completed. The company built a road from the town of Cornucopia to its millsite, a distance of three miles. Its water-power development consists of a ditch 700 ft. long, 2,280 ft. of flume, and 1,300 ft. of 9-in. pipe. The water has a head of 455 ft. Three separate water-wheels are employed in furnishing power direct—one for the batteries and rock-breaker, one for the vanners, and one for the generator, which furnishes power and light for the drills and the mine. The ore is conveyed to the mill by a tramway 3,140 ft. in length and there is an additional tramway 560 ft. long, connecting two of the tunnels. Ore sufficient is blocked out to run the mill 18 months. The average width of the vein is 4½ ft. and the average milling value of the ore is $22 per ton; 46 men are employed.——The Mayflower also situated in this district, is owned by the Stampede Mining & Milling Co. A 10-stamp mill and an 80-ton per day cyanide plant have been recently installed; 35 men are at work on this property.

UTAH.

JUAB COUNTY.

The shaft of the American property near the Beck tunnel is now down nearly 150 ft., and but little more development work will be required to open up the ore deposits which extend from the Beck tunnel into this ground.——A small force of men is now at work at the May Day taking out some of the old plant, and this will be replaced with improved machinery which will enable them to handle the May Day successfully. It is thought that these changes can be made within three or four weeks, and then trial-runs upon the different grades of ore will be made.——The foundation for the new machinery of the Little Chief Co. was completed last week, and the boiler has been put in position. The gallows-frame is now being put up and Joseph Hannifin, the superintendent, expects to have everything in shape so that work can again be taken up in the mine within a week.

SALT LAKE COUNTY.

A 50-ton shipment has been made from the Carisa mine valued at about $70 per ton. H. S. Joseph, the general manager, reports that a cross-cut on the 300-ft. level has been in ore for 25 ft. and that the other wall is not yet in sight.

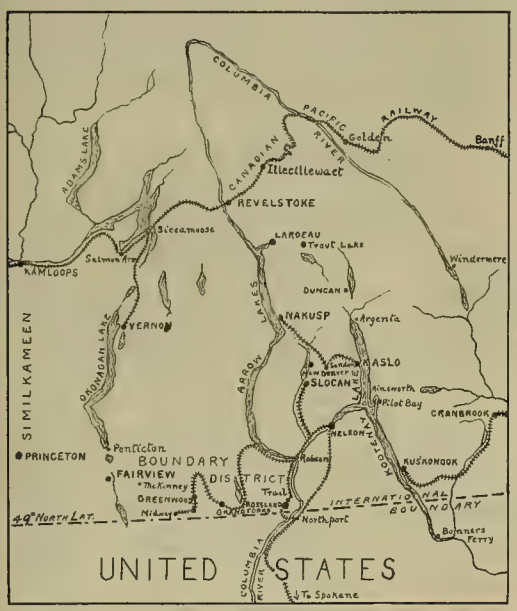
BRITISH COLUMBIA.

At the Last Chance mine, which is owned by the Last Chance Mining Co., of Spokane, a strike was made last week. The tunnel in which the new strike was made is a continuation of a tunnel of the American Boy which had been driven to the line of the Last Chance claim, and which was purchased by the latter company. Men have been working in the drift since the company resumed operations a few months ago, and a good body of ore has been found. There is now 10 in. of high-grade galena ore, and the face of the drift is spotted with mineral. At the point where the orebody was encountered they have a vertical depth of 1,000 ft., and they can drive 1,000 ft. more before reaching the end of their ground.—— Development work has been discontinued at the Meadow Lark claim. When the gallows-frame is completed for the Granby's new Victoria shaft it will be over 100 ft. high.——Since the visit of M. M. Johnson to the Maple Leaf group, Franklin camp, recently

bonded by the Dominion Copper Co. for $125,000, preparations have been made at the property to house the working force for the winter. —— This week several hundred tons of ore were sent out from the B. C. mine, Summit camp, to the B. C. Copper Co.'s smelter, the first shipment in a couple of years from this old-time shipper. The Oro Denoro will re-join the shipping list soon. —— Eastern coke is now arriving at the Granby smelter.

Both in Rossland itself and in the vicinity a distinct revival of mining has taken place owing to the new discoveries of richer ore in the deeper parts of the principal mines, discoveries which R. W. Brock, acting for the Geological Survey, had predicted. The work of Mr. Brock and his assistants is much appreciated in the district, owing to the renewed confidence it has imparted both to mine managers and prospectors. At Trail, alterations and additions are being made to the smelter, and similar improvements are taking place at Nelson, Grand Forks, and Greenwood, showing that the output of the mines supplying these furnaces is such as demands more extensive and better plants for its treatment. All the mines of the Boundary copper camps are active, and their general tone appear to suggest healthy improvement.

At the silver-lead districts of Slocan there is an awakening also; several mines are working profitably. The find-



Map of Part of British Columbia.

ing of the vein of the Rambler-Cariboo mine at a depth of more than 1,200 ft. is of the greatest importance to the district, pointing as it does to the probability of the silver and lead ores being found in depth.——At Hedley, in the Similkameen valley, the large Nickel Plate mine gives surface indications of large orebodies, and when the railway freights are reduced, it is expected that these ores will prove payable. C. Camsell, who is working along the Similkameen valley above Princeton, is quite enthusiastic about the large masses of ore in that region which, although low grade, can, he confidently believes, be profitably worked, upon the completion of the railway. On the Coast, about and to the northward of Vancouver, favorable reports concerning the mineral deposits both of the mainland and Texada island are being made, and evidences of progressiveness are everywhere visible.

The strike at Fernie has cut off the coal supplies of the smelters at Nelson and Trail, so that the smelters have been forced to decline further shipments for the present. The same cause has contributed the delay in blowing in at Northport. This makes an embarrassing situation for the many shippers, who depend upon these works for the marketing of their product. Notwithstanding this, however, the general feeling is that the inconvenience would be a small price to pay for a victory in favor of the open shop at the coal mines. The whole trouble was precipitated by the Union trying to force the company to discharge the non-union men, amounting to less than three per cent of the force, and in view of the arrogance of such organizations of late in the district, the general feeling—shared by probably a majority of the men themselves—is of hope that the company will carry their point and continue to run 'open shop'.

MEXICO.

CHIHUAHUA.

The San Toy Mining Co., in the Santa Eulalia district, is to have a 4½-mile aerial tramway, which is being built by the Trenton Iron Works.——The Rio de Plata Co. is to have a complete reduction plant, including 25 stamps, a tube-mill, concentrator, a 60-ton cyanide plant, and Robins belt-conveyor. The mine is 110 km. from Aguatos on the Orient railroad. D. W. Shanks is general manager.——The Terrazas smelter, 25 miles from Chihuahua, has started operations on the copper ore of the Rio Tinto mine. Its capacity is 250 tons per day. David Goodale is in charge.——The Batopilas Mining Co. is building a trail from Batopilas to the Orient railroad; this will lessen travel to the railroad from six days to three.——The Monterde Mining Co. is pushing development work; during the year 1,400 ft. of such work has been done under the direction of R. M. Bagg, the general manager.——The Monterde mines are now showing a large amount of ore, the main vein having been cut at 106 ft. below the original workings. On this vein the north drift has been run 160 ft. and has been in ore all the way with four feet in the breast. In doing this work some bunches of very high-grade ore have been cut; 35 men are employed. It will require $50,000 to build a mill and provide working capital, but when this is done, the mine should earn dividends regularly.——There is talk at Parral of re-starting the Santa Rosalia smelter.——The Refugio mine at Minas Nuevas is spending a good deal of money in improvements. W. J. Morril is in charge.—— The Tres Amigos Mining Co., B. L. Croff general manager, is developing its property by an adit on a vein ranging in width from 25 to 40 ft. The ore is being stacked pending the completion of the railroad from Temosachic; it averages 6% copper, ½ oz. gold, and 4 oz. silver per ton.——The Guaynopa Mining Co., of which Howard Veidel is superintendent, is sinking a winze in the tunnel on the old Guaynopa mine. The winze is down about 40 ft., with a paystreak two feet wide. It is claimed that some of this ore runs 2,000 oz. silver per ton and the company has already shipped 1,200 oz. ore.——The Utah Mining Co. has a tunnel in over 100 ft. with cross-cuts. The ore is 80 ft. wide and is considered the same body as that in the Tres Amigos.

DURANGO.

The Boca del Cobre mines are reported sold for $300,000 gold to a company of California capitalists. The deal was made through Thompson & Gilliam, of Los Angeles. The property is in the Nazas district.

Through an option obtained by F. W. Foster, of Mexico City, the Garibaldi mine, of Guanacevi, Durango, which was the property of Arturo Longega, has been purchased by the Mines Finance Co. John B. Farish is its consulting engineer, and is represented in Mexico by George J. McCarty. This was a strictly cash operation, the consideration being considerably over half a million dollars. This mine is on the rhyolite-andesite contact, and adjoins the Santa Cruz mine of the Restauradora group, which was purchased some months ago by the Cia. Minera, Ltd., from the National, Hipotecario, and London banks.

JALISCO.

The Verdiana mine, in the Ameca district, has been bonded to El Vasto Mining Co., of Oakland, Cal. Two neighboring mines—the Atrenda and the Aguila —are doing well.——C. P. Dickinson and J. H. Means, in behalf of the Mexican & General Mines Syndicate, of London, have completed an examination of the San Pedro Analco Mining Co.'s property in the Hostotipaquillo district. These mines have been productive for many years.

Personal.

C. S. HERZIG is in Siberia.

ROBERT T. HILL has been to Cananea.

JOHN WELLINGTON FINCH is at Goldfield, Nevada.

WALDEMAR LINDGREN has returned to Washington.

FORBES RICKARD is examining mines in Nova Scotia.

E. A. H. TAYS is examining mines in Gila county, Arizona.

JAS. W. NEILL can be reached at 159 Pierpont St., Salt Lake City.

R. A. F. PENROSE has returned from South Africa and is at Denver.

EDWARD L. DUFOURCQ is examining mines in Chihuahua, Mexico.

WILBUR E. SANDERS has returned to Helena, Mont., from Alaska.

W. L. LELAND, on his return from Nome, Alaska, has gone to Boston.

GEORGE KISLINGBURY is examining mines in Arizona and New Mexico.

ARTHUR L. PEARSE was in San Francisco and is now on his way to England.

W. F. CROSBY, manager of the Butters plant at Virginia City, is at New York.

C. W. MCARTHUR has returned to Silverton from a short visit to Denver, Colorado.

MARK R. LAMB was in San Francisco for a few days and is now at Goldfield, Nevada.

FRANK H. PROBERT, of Los Angeles, is on a visit to clients at Boston and New York.

T. H. OXNAM has returned to Los Angeles, after a beneficial rest in Cornwall, England.

F. W. BRADLEY and ALBERT BURCH have offices now at 1611 Franklin St., San Francisco.

W. H. NUTTING has been appointed smelter superintendent for the Utah Copper Company.

A. L. HARBISON has returned to Vincennes, Ind., from Denver and Park county, Colorado.

A. C. BLACKWELL, managing director of a dredging company at Burma, is visiting California.

W. E. THORNE is at San Jose, Cal. He expects to take a special course at Stanford University.

L. C. GRATAN is finishing this season's geological work in Shasta county. He is now at Kennett.

CARL HAND is expected shortly in British Columbia to look after his interests on Kootenay lake.

A. P. ROGERS, formerly at San Francisco, has opened an office at 446 Bradbury Bdg., Los Angeles.

JAMES PASCOE is superintendent for the Mount Boppy gold mine, near Cobar, New South Wales.

DAVID W. SHANKS is general manager for the Cia. Minera de Rio de Plata in Chihuahua, Mexico.

H. V. WHEELER, of Los Angeles, is engaged in professional work in the Ballarat district, California.

ANSON D. CARTWRIGHT is now superintendent for the Colonial Silver Mines, Ltd., at Cobalt, Ontario.

W. S. KEITH, assistant superintendent of the Kennett smelter, has resigned and is leaving for Mexico.

CHARLES O'CONNELL has been appointed superintendent of the Green-Meehan mine, near Cobalt, Ontario.

FRANK L. HESS, of the U. S. Geological Survey, is investigating the occurrence of rare metals in Colorado.

W. E. THORNE has been making examinations of placer ground in Park county, Colo., for Eastern clients.

EDWARD W. RALPH is now superintendent underground for the Boston-Ely Development Co., at Ely, Nevada.

A. H. HOLMES is superintending work at the Tres Amigos mine in the Guaynopa district of Chihuahua, Mexico.

E. P. JENNINGS has returned to Salt Lake from three months' work in the iron mines of Michigan.

HILLS & WILLIS, of Cripple Creek, Colo., have opened offices at 318 McPhee Bdg., Denver. They will continue to keep their offices at Cripple Creek.

EDGAR E. BARKER, of Grass Valley, recently with the Progreso Mines Co. in Lower California, Mexico, is now engineer for the Globe Con. Copper Co. at Globe, Arizona.

F. H. NETTLETON, who has been in Alaska during the summer, in the interest of Finch & Campbell, of Spokane, has returned and is now making an examination at Ainsworth, on Kootenay lake.

CHESTER NARAMORE has been appointed Statistician of the U. S. Geological Survey for Colorado, New Mexico, South Dakota, and Wyoming under the direction of WALDEMAR LINDGREN, with headquarters at 612 Commonwealth Bdg., Denver.

Obituary.

JOHN BRECKENRIDGE, general manager of the Paloma Mining Co., of Guadalajara, Mexico, died at St. Louis, Mo., on October 15.

COPPER STATISTICS.—According to James Lewis & Sons, of Liverpool, the imports of copper into Liverpool and South Wales were 68,098 tons fine during the first nine months of the current year, as compared to 61,900 tons during the same period of 1905. These figures do not include Chile copper, of which 13,031 tons were imported, as against 17,316 tons in 1905. The total visible supply is placed at 12,483 tons, as against 16,304 tons this time last year.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, November 7.

Con. Virginia	$1.20	Manhattan Con	$0.85
Ophir	3.25	Jumping Jack	0.55
Savage	1.45	Midway	2.75
Tonopah Ex	7.80	Montana	4.15
Belmont	6.75	Mohawk	15.70
Jim Butler	1.70	Silver Pick	1.45
Jumbo	4.15	Sandstorm	0.83

METAL PRICES.
By wire from New York.

	Closing Prices—November 1.	Closing Prices—November 8.
Copper—Lake (cents per lb)	22 @22¼	22¼ @22½
" Electrolytic "	21.40@22	21⅜ @22
" Casting "	21 @21¼	21¼ @21½
Lead "	5.75	5.75
Spelter "	6.25@6.30	6.28@6.31
Silver (cents per oz.)	70¼	71⅛

ANGLO-AMERICAN SHARES.
Cabled from London.

	November 1. £ s. d.	November 8. £ s. d.
Camp Bird	1 7 9	1 9 6
El Oro	1 6 9	1 7 6
Esperanza	2 8 9	2 11 3
Dolores	1 14 3	1 13 9
Oroville Dredging	1 1 10½	1 1 9
Stratton's Independence	0 3 9	0 3 9
Tomboy	1 8 9	1 10 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

CURB QUOTATIONS—NEW YORK.

	Closing Prices Nov. 1.	Nov. 8.
Bingham Central	2¼	2⅛
Boston Copper	32½	31½
Calumet & Arizona	150	155
Cumberland Ely	13¼	13⅛
Dolores	8⅜	8⅜
El Rayo	7⅛	8¼
Guanajuato Con	4⅞	4¾
Giroux Con	12½	12⅛
Greene Con	25	25¼
Nevada Con	20	20½
Nipissing	30¼	29
Tennessee Copper	45¼	44¾
Tonopah Ex	7¼	7¾
Tonopah-Belmont	7¼	7¼
Tonopah	21¼	21¼
United Copper	65½	69
Utah Copper	34	34

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

DEPUTY UNITED STATES MINERAL SURVEYORS are exempt from jury duty in the State of California.

ARGOL is a crude potassium tartrate often used by assayers as a reducing agent. The carbon obtained is in the nascent state, and hence is very active.

TUNNELING in stiff blue clay can be assisted by driving spiling forward around the face. This will loosen up the clay and assist the pick and shovel work. A hydraulic jack will be found very useful to drive the spiling used in this system of forepoling.

THE most important regions of thermal activity coincide with the principal centres of volcanic eruption, as illustrated by the conditions in the Yellowstone Park, the Eifel mountains, northern Bohemia, the north island of New Zealand, and the Auvergne.

THE carbon dioxide in thermal springs may be generated from limestone by the action of sulphuric acid derived from oxidizing pyrite, by heat alone if the gas is given an opportunity to escape, or by the reactions of hot solutions of silica during contact metamorphism.

AS MINING in itself is merely the extraction of ore from he earth, and has to be followed by extraction of metal from the ore, the working costs of any given mining business, except for comparative purposes, must cover all expenses up to marketing the final product.

WARMING PANS in which dynamite is thawed should be cleaned at least once a week with warm soda solution to remove any nitroglycerine that may ooze out of the powder. The solution should be made up of two parts of caustic soda and two parts of glycerine to 96 parts of water.

IN Colorado the cost of erecting a mill per ton of ore treated is as follows:

20 to 30	tons	capacity	daily,	$250 to $260	per	ton	of	crude	ore	treated.
40 to 50	"	"	"	$200 to $260	"	"	"	"	"	"
75 to 100	"	"	"	$160 to $180	"	"	"	"	"	"
150 to 200	"	"	"	$133 to $150	"	"	"	"	"	"

STRONG TRESTLES can be made of 2 by 8 in. lumber, which will serve every purpose on tram-lines for transportation of ore, in cars holding up to two tons and even more. Ordinarily the amount of timber put into structures of this description is much larger than is really required. Such trestles may be safely carried to a height of 40 or 50 feet.

THE earliest phase of volcanic exhalations is distinguished by the presence of fluorine, arsenic, phosphorus, boron, tin, bismuth, copper, iron, and manganese. In the second phase there appear hydrogen sulphide, sulphur dioxide, with other sulphides and bases. The third phase is marked by the presence of carbon dioxide.

NOT only is the practical valuation of a mine dependent usually more on prospective value than on the estimated value of the ore blocked out, but it must be understood that the calculation of this last is by no means a scientific certainty, and that the correctness of the estimate depends on conditions of occurrence which vary in different mines.

IN the construction of assay-furnaces for use with coke, the firebars should be designed so as to be easily replaceable without drawing the fire, the iron bars being about one inch square and not crowded. The ash-pit should be made with a forward slope, especially if bullion is to be melted. With a well-clinkered furnace, a temperature of 1,400° F. should be easily maintained.

THE Australian miners call the shift from 12 P. M. to 8 A. M. the 'dog watch.' In our Western mines it is called the 'grave-yard shift.' It is the least desirable, as trespassing most severely on the natural hours of sleep. In many mines the breaking of ore ceases during this shift, in order to permit of removing waste and freshening the air in the workings.

A SIMPLE METHOD of handling a copper carbonate ore is that in use at the Snowstorm Co.'s mill at Larson, Idaho, where about 97% extraction of copper is being obtained. After crushing, the ore is run into agitators, where it is mixed with a 10% solution of sulphuric acid and a solution of chloride of lime. Thus a solution of copper sulphate is formed, while the silver remains as a precipitate of chloride. From these agitators, which are three in number, the copper sulphate solution goes through a series of six settling vats. From the solution the copper is precipitated with scrap iron, and the residues containing the silver chloride are treated with sodium thiosulphate. The solution of silver thiosulphate thus obtained is passed through settling vats and the silver is precipitated from the clear solution by sodium sulphide, the precipitate being filtered and shipped for refinement. The ore runs from 2½ to 3½% copper and about 7 oz. silver.

ALUMINUM SILICATE is an abundant constituent of many of the most common rock-forming minerals, and is an essential constituent of the mud, clay, shale, and slate which have arisen from the disintegration of these minerals. It has not yet been found possible to employ these materials as a source of the metal or of its useful salts. The most important aluminum minerals are bauxite and cryolite. The former, the chief source of aluminum, is a hydrated oxide of white or brown earthy appearance. It may be often recognized by a characteristic earthy smell, and positively determined by the blue mass obtained by heating with cobalt nitrate on charcoal. The latter is fused and used as a solvent for bauxite, from which solution aluminum is obtained by electrolysis. Cryolite, which means ice-stone, may be detected by its three rectangular cleavages and fusibility. If powdered and put in water, it is scarcely visible. The mineral is rare, the principal deposits being at Ivigtut in West Greenland, where it is associated with fluorite and pyrite.

THE use of soapy water as a lubricant for air-cylinders is recognized as good practice. Even where oil is used as the regular lubricant, soapsuds should be fed in from time to time to clean out the valves and discharge ports. There are many well-authenticated cases in which only soapy water is used as the lubricant. Soapsuds and Dixon's flake graphite mixed make an ideal lubricant for air-cylinders, for by the addition of graphite far less soapy water is necessary than would otherwise be required. Hand oil pumps will pass soapsuds and graphite perfectly satisfactorily, or the graphite may be fed separately in a dry state through a separate cup, while the soapy water passes through the regular lubricators. There is only one caution necessary in this method, namely, to introduce sufficient oil before shutting down the compressor to prevent rusting of the cylinders and valves when the machine remains idle. Rust, however, forms very much less rapidly in the presence of graphite than upon surfaces not thus coated—in fact, it cannot form at all upon a surface completely covered with a film of graphite.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Who Is a Mining Engineer?

The Editor:

Sir—The old question, "Why is a crow?" deserves to be bracketed with the above. We have the mining industry divided into various departments—copper, gold, lead, tin, zinc, iron, coal, etc., (with twenty more)—in which some people may overlap into half a dozen and some specialize over a part of one. Moreover, we have consulting engineers, mine valuers, general managers, superintendents, chief engineers, metallurgists, assayers, surveyors, inspecting engineers, etc., etc. A man may be all these or only one of them. The term engineer is applied to all of these in some connection or another, and the more specific term mining engineer to a great portion of them. They are really many different professions, but so closely allied that a man may slip from one to the other or be several at the same time. The general term does very well to describe oneself for jury duty, but in the industry itself we need to particularize a little. A step in the right direction would be to confine the term generically purely to men who direct actual mining works or mining investments as at least a portion of their profession, and not to include surveyors, assayers, or metallurgists. Most of the discussion has revolved around the question as to what training and experience or position a man should have in mining works before he is entitled to call himself an engineer. On this there is, to my mind, no finality. The term mining engineer is not a thing that belongs exclusively to those who have a degree conferred by some recognized institution. However, I have no sympathy for those who carp at college training as a basis for professional training. Of all the men that start in the profession, but few succeed, whether they come from the college side or the shovel side. My own impression is that a greater ratio of those who start from the college side succeed, and I have not yet met the successful man who came up through practical work who does not himself regret he did not have the college training. My personal experience is that I have met more 'practical' quacks than 'college' quacks. In any event, the test whether a man has the right to the title is purely a question as to whether he does good honest work in the direction of mining enterprises. Given any jury of men connected with the industry, I believe they would subscribe to the above as the only qualification for the profession.

No one can prevent men of immature experience or poor training from attempting professional work of this character, but the members of the profession do very generally set themselves against this type, and as a result the whole basis of professional qualification has been greatly improved.

There is one result that this discussion might have, and that is to stamp even more opprobrium on the sort of person who calls himself a 'mining expert.' This variety of a quack is very trying, especially when he bolsters himself up with a few letters after his name. Most engineers belong to various learned societies. To try to support one's standing by relying on their connection with such societies is itself a sign of a groggy position. Every member of these societies knows that they make little attempt to pass on qualifications of members. They merely publish professional literature. Dignified engineers never use such titles except in connection with such literary work, in which case it is eminently proper. Myself, I never employ or recommend men who seek a standing from the fact that they are an M. A. I. M E., M. I. M. M., M. I. C. E., F. R. G. S., M. A., E. E., A. B., B. S., E. M., etc. or any part of it. Nor would I accept a report on a mine signed by such a person for more than a possible warranty for further investigation. And above all do I refuse all association with the 'mining expert.'

A LONDON INVESTOR.

London, October 12.

Who Is a Mining Engineer?

The Editor:

Sir—Several of my friends and acquaintances have verbally criticized my article published on October 6 on the grounds that I limit the term 'mining engineer' to college graduates who have also had practical experience. This impression arises from not taking my article literally and exactly, but by trying to read between the lines. As this is a quite general habit and as many have thereby got a wrong impression of my meaning, I think it only right to add to my previous remarks the statement that, as I understand the definition of 'mining engineer' given in the Century dictionary, there is no limitation placed on the method whereby a man may become "skilled in the principles" of mining. He may become thus skilled at college and he may attend college without becoming thus skilled. He may become thus skilled by taking a correspondence course or by simply studying by himself. There is one thing certain, however, that no man can comply with the Century's definition without being a *student* himself. The man who makes a success of mining by hiring other people's brains cannot comply with the definition of 'mining engineer.'

GEO. J. BANCROFT.

Denver, October 24.

Black Sand.

The Editor:

Sir—I am much interested in the article appearing in your magazine pertaining to the experiments now being carried on by Dr. Day and others, to perfect a method of extracting the values that are carried by the beach and river sands of this coast. I am a practical miner of some experience in different localities, and have spent two years investigating this matter. I am confident that some of these deposits are of sufficient extent with enough values to make the profitable working of them possible, if a successful method were found to separate the different metals. When the United States Government made a special appropriation of a large sum of money, placing the same in the hands of one of the heads of departments to be used to further investigation on this line, I expected that the problems would be solved. But while Dr. Day has satisfied himself and the miners that the values exist, we have not as yet received any encouragement to attempt operations on a commercial basis. The smelters give returns only on the gold which represents merely a part of the valuable contents. As at the mine in which I am interested the gold amounts to less than one-third of the whole, the fact remains that we are not one particle better off in this respect than before the appropriation was made. And I firmly believe that when we do attain success in this matter, it will be brought about by men that are directly interested in black sand; therefore I would like to have the assistance of your estimable journal in bringing the matter to their attention. I suspect that every difficulty that we have to contend with has been and is being overcome by individuals working independently. If we were able to take advantage of all the knowledge, experimental and practical, already gained, we could, I believe, perfect a practical working method. My experiments have consisted entirely of investigations into the most practical method of separating the black sand carrying values from the alluvial

deposits in the river channels, and I should be very glad to correspond with the readers of the MINING AND SCIENTIFIC PRESS that have spent their time working on the problem of extracting the metals from the concentrated sand, believing this would be of mutual advantage.

L. A. MAXWELL.

Crescent City, Cal., October 10.

[Mr. Maxwell's suggestion is a good one. There is nothing more useful than for men to compare their experience and to exchange ideas. It is this purpose that we try to promote every week in the MINING AND SCIENTIFIC PRESS.—EDITOR.]

The Geological Investigation of Orebodies.

The Editor:

Sir—It may seem trite to remark that in the business of mining there are many details either poorly managed or else not well understood. But all triteness may be eliminated by leaving the general for the specific, and there is one particular and fundamental phase of mining which yet needs much attention. This is the scientific investigation of orebodies for mine development. The statements to be made herewith come entirely from personal experience, while working, directly or indirectly, for mining companies in different parts of the country, and are put forth with a most sincere desire to aid, if ever so little, in placing the mining industry upon a firmer basis.

The numberless small mining companies, with an aggregate capital of many millions of dollars, are almost invariably ignorant, and therefore neglectful, of the basic importance of properly delineating and thoroughly understanding an orebody; and even the larger companies, with their corps of trained men, are too frequently lacking in this regard. The result is that not only is a vast amount of money spent needlessly, but legitimate mining is often dealt what is commonly called 'a black eye.' There are two distinct forms of this defect, concerning which, because the trouble lies at the very root of a large portion of the mining industry, it is hoped that a discussion may be initiated.

I have stood at the top of the head-frame of a certain California mine and counted, within a radius of a mile, six defunct 'mines' with hoists and accessories, each representing a loss of from $25,000 to $100,000. And, with a feeling of great impotence, I can at present discern several more in the making. Such a condition of affairs is indeed pitiable, and, being absolutely needless, it is a severe commentary upon the business sagacity of our capitalists. There are definite reasons why such a state of affairs is not necessary and it becomes the duty, as well as the business, of the mining engineer and geologist to act promptly in preventing such waste of energy and capital. Each one of the six properties just noted would have had no money invested upon it if a competent geologist and engineer had examined it at the beginning. But no; depending solely upon the word of a so-called 'practical' miner, who is able to tell good rock by looking at it, or at most by an occasional panning, the average aggregation of mine-mad capitalists puts up thousands of dollars in hard cash literally to sink them into the cold ground. The expenditure of perhaps a thousand dollars to find out what there is on the property is held to be a foolish waste; it is far more comfortable to work in the dark and have expectations. The ignorance of the average 'investor' is often amazing. A man who would never consider launching into business without first a careful inventory of goods, with every cent accounted for, and with all details fully worked out, will yet plunge headlong into a hole-in-the-ground proposition on someone's unsupported statement that good rock occurs there. And if such a statement be reinforced by a specimen showing a little free gold, the would-be investor is completely hypnotized. If a mining engineer be of too serious a turn of mind, he is tempted to profanity; if he be properly philosophical, he will smile and be content to await the inevitable end. Well-meant, gratuitous advice is scorned.

But this is the more easily corrected and less insiduous form of the evil referred to. The greater trouble lies in the development of a mine after it has become, if not a producer, at least a property with some ore blocked out. When an orebody has been partly opened up by the usual methods, it becomes far too easy for the foreman and superintendent to assume that the body is of a particular form and that as a consequence more ore is to be developed by a certain line of work. The slogan of the Angel's Camp region—"cross-cut!"—is a sample of this. Thus a set method of developing the ground is obtained, which is commonly not scientific in any sense, and is therefore unduly expensive. A simple quartz vein between well-defined barren walls is of course outside the limits of these remarks, unless the ore-shoots are peculiarly complex. But the mining fraternity as a whole has yet to realize fully that in general only a thorough investigation of a partially developed mine by a competent geological engineer can furnish the necessary data for future work. The well-worn saying that "gold is where you find it" is undeniably true as a logical statement, yet taken in the sense in which it is meant a great harm is done to the proper development of our mining resources, for it conveys an absolute untruth. We must not attempt to excuse ignorance by insinuating that something is forever unknowable. The kernel of the whole matter lies right here. The importance of real geological knowledge on the part of examining engineers is just commencing to have adequate realization. In the past it has been put aside as of secondary importance, and even then only a few of the leading geologic relations have usually been deemed sufficient. In the broad sense, geologic relations govern absolutely the formation of orebodies and it obviously is not right either to estimate the value of a mine solely by what ore is actually in sight or to draw up a plan of mine development without thorough geological study. Fortunately, the mining world is coming to appreciate this and one of the struggles of the future will be to have, not more geological work, but to have such work done by competent men. The fast growing science of the economic geology of metalliferous deposits has done much, and is doing more each day, to increase our exact knowledge of the occurrences of the precious metals, until now it is fairly possible to gather the facts necessary for their cheapest extraction. The time is ripe for the widespread inculcation of the idea that the business of mining, when entered into in a truly scientific way, is one of the most remunerative ways of spending money. And yet the vast majority of people look upon mining as a gamble, pure and simple. A few examples in outline will serve to illustrate the matter.

At Angel's Camp, where the only plan of mine development is to cross-cut, there are two principal geologic facts not properly recognized. First, there is the presence of fairly well-defined shear zones in the schist connected with the main quartz-bearing easterly dipping fissure below. The famous Utica shoot is of this type. Second, there is a series of northwest-southeast veins intersecting the foot-wall of the main lode at an angle of 40°. Neither of these facts has received proper attention, either as an aid to intelligent prospecting or systematic mine development. It is needless to state that a careful geologic investigation of the Utica shoot itself has never been made, and that thousands of dollars have been thrown away in useless work. The whole of the

Mother Lode region needs careful geological study. On the contrary, it can be said that at Copperopolis a study of the orebodies has revealed clearly the nature, place, and conditions surrounding the copper-bearing lenses. The Comstock lode was worked for years in the most expensive manner because the exact nature of the orebodies was not understood.

Here again, the idea of 'verticals' has never been accepted as a basis for mine development. And today many promising properties throughout this western region stand idle because of lack of proper geologic investigation to guide exploratory work. Until a few years ago it was the privilege of the miner to lead, the geologist to follow. And geology suffered as a natural result. But this relation no longer holds true, for with the rapid advance of research work into mineral deposits, the geologist can justly claim leadership, if he will. Therefore, it is time for the properly trained scientist to tell the miner what to do and how to do it when opening up an orebody. The whole future of truly scientific mining rests right here.

JOHN A. REID.

Stockton, Cal., October 29.

Position of Amalgamating Plates in the Stamp-Mill.

The Editor:

Sir — The letter in your issue of September 29 by Mr. Percy Morgan, recalls experiments made by me some years ago. The mill had 20 stamps, with eight 6-ft. Frue vanners and a Gates slime-plant below it. The ore was a heavy sulphide, with a very low content in free gold.

The existing plates consisted of four 48 by 144 in. silver-plated copper plates, set below the batteries in the usual manner, with a grade of 2½ in. per foot. As it was necessary to elevate the pulp to the vanners, the point was considered of installing the plates above the battery-floor, thus leaving the space around and in front clear. As an experiment, one of the plates was placed away from the mortar, the pulp from five stamps was elevated and taken to this plate through a launder with a grade of four inches per foot. The plate was set first with a grade of 2¾ in. per ft., but this was found to be insufficient to clear it properly, so the grade was increased to three inches, and later to 3½ in. per foot.

Under these conditions the plate was run for thirty days, samples being taken every fifteen minutes, by hand, from the mortar lips and from the tailing-trap. Samples were also taken from the other three plates, in the same manner and from the same places. Even with the grade given, it was found necessary to add more water to the head of the experimental plate than the pulp contained when discharged from the mortar. Ratio determinations were made from time to time to learn the extent of this addition. It was found that 8.4% more water was used on this plate, and that the amalgam recovered was 3.8% less, but 1.2% was later recovered in the launder leading to the plate, so that the deficiency amounted to only 2.6%. The excess of water gave considerable trouble on the two vanners fed over this plate and increased the value of the vanner tailing from 7.2 to 9% of the heading sample.

The operation of this plate was not at all satisfactory, the pulp lacked the wave it formerly received from the mortar, and instead of the heavier particles being forced down the plate by successive pushes, as is quite noticeable on the plates before the mortar, it ran over the plate at a much greater velocity; further, a greater proportion of the amalgam was caught on the lower section. After the above results it was decided that the proper place for plates was below the mortars, and it is my opinion that when perfect amalgamation is desired the place for the plates is below the mortars.

CLIFFORD G. DENNIS.

Terlingua, Texas, October 20.

DIVERTING BATTERY-DISCHARGE DURING CLEAN-UP. — Fixed to the top of the chuckblock, immediately beneath the screen frame, is a sheet-iron catch-plate 8 in. wide, which deflects the pulp outward, enabling a satisfactory screen sample to be taken. In ordinary running the pulp falls from this catch-plate to a baffle-board, which deflects it back on to the lip of the mortar. When the plate is to be dressed, this baffle is removed, and a sheet-iron launder is substituted. This rests on chairs fixed to the sides of the table-frame, and serves to catch all the pulp from the catch-plate and carry it to one side of the plate. The pulp then falls into a portable launder 14 ft. by 6 in. by 6 in., down which it runs into a permanent launder situated under the working platform at the bottom of the plate. This permanent launder runs the full length of the mill and discharges into a distributing box placed at the head of an extra plate 5 by 12 ft., situated outside the mill.

When a plate is to be dressed, the amalgamator first puts the portable launder into position, one end resting on the extra launder under the platform, and the other resting on a support on the king-post. He then lifts the sheet-iron trough into position, and the pulp forthwith flows to the extra plate outside the mill. A piece of canvas is hung over the screen to prevent splash, and two pieces of sheet-iron are pushed into saw-cuts in the screen frame at each end; these serve to throw the pulp delivered at the corners of the screen frame toward the centre of the catch-plate, thus preventing splash and leakage on to the main plate at the corners. These sheet-iron plates do not reduce the screen area at all. No wedges or fastenings are required, and the weight of the portable launder and the sheet-iron trough are negligible.

The scheme has proved perfectly satisfactory in every way, the main plate being quite dry and clean during dressing and steaming, and the labor involved in fixing the gear being nothing. The extra plate behaves quite normally, though as it only runs 4 hours 20 minutes per diem, I consider it advisable to use copper that was already 'set.' This plate has a lock-up cover, it is dressed each time immediately before dressing the main plates. The running time saved in this mill for dressing plates, by using this gear, amounts to 8 days 8 hours per annum, plus 18 hours for steaming, making a total of 9 days 2 hours, which in our 40-stamp mill means 1,816 extra tons crushed at no extra cost for labor.—R. Weston in *Journal* Chem., Met. & Min. Soc., South Africa.

AN undertaking of unusual magnitude in land reclaiming has lately been investigated by the Belgian Government. It is proposed to lay dry the great basin of the Zuyder Zee, which for the last 800 years has been flooded to a depth varving from 10 to 20 ft. The area, 5,250 sq. m., is one-sixth of the size of Holland. A dam is to be built nearly 20 miles long, having a breadth of 30 ft., at a height of 18 ft. above sea-level. On this it is proposed to build a wagon-road or a double-track railroad, the whole undertaking costing about $60,000,000. The Hollanders are unrivaled in reclamation work and it is probable that their immense experience will in due time permit them to acquit themselves brilliantly in this great undertaking, which has been so long discussed.

THE great prizes in mining are realized by those who take the risks, when the mines are not greatly developed, and consequently when they do not have much ore exposed.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Under the statute requiring that a notice of the location of a mining claim be posted at the point of discovery, and two conflicting claimants posted notice at the same point, it was decided that this fact, in absence of evidence to the contrary, warranted the presumption that both based their claims of discovery on the same natural conditions, and that, therefore, a discovery of mineral actually existed.

Fox *v.* Myers (Nev.), 86 Pac. 793.

Where a mining company bought a 'Huntington mill' of the 'latest improved' patent for the reduction of ore, it was held that there was no implied warranty of fitness for the purpose intended, though the seller was informed of its intended use.

Mine Supply Co. *v.* Columbia Mining Co. (Ore.), 86 Pac. 789.

Under the statute providing for priority of location rights on the discovery of mineral in the public domain, it was held that a locator had made a discovery when he found rock in place containing mineral in sufficient quantity to justify him in expending his time and money, whether the rock or earth is rich or poor, provided that in a lode claim the lode must have special reference to the formation and peculiar characteristics of the particular district in which it is found.

Fox *v.* Myers (Nev.), 86 Pac. 793.

Where a seller of mining machinery sold a 'latest improved Huntington mill,' but furnished a mill of an old style, there was a breach of contract, and the fact that the purchaser accepted and made an effort to use the mill was not a waiver of his right to damages for such breach, and the measure of damages was the difference between the value of the machine agreed upon and that of the one furnished.

Mine Supply Co. *v.* Columbia Mining Co. (Ore.), 86 Pac. 789.

Under the statute of California where notices of location of a mining claim recited a location 1,500 ft. of 'this vein or lode of gold-bearing rock,' etc., it was held that such recital indicated that the notice so posted on the ground was posted on the croppings of the lode, or in such close proximity thereto that the croppings appeared or had been exposed.

Daggett *v.* Yreka Mining &c. Co. (Cal.), 86 Pac. 968.

The mere introduction of a map in evidence in a controversy over the location and description of a mine which purports to show the lines of the location of the claimant, was held to be of no value, where such map was not supported by evidence which defined the lines, and which departed widely from data established by the best evidence the claimants could offer to prove the original location of their claim.

Daggett *v.* Yreka Mining &c. Co. (Cal.) 86 Pac. 968.

Where an agent in obtaining an interest in a mine for his principal, and aids in securing a patent, knows of the existence of contracts and interests of other persons in such mines, this knowledge of the agent is imputed to his principal.

Carter *v.* Gray (Ark.), 96 S. W. 377.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The two rocks from Los Angeles, marked F. G., are rhyolite-porphyry.

Rocks from Beowawe, Nev., marked O. B. A., are: No. 1 and 2. Rhyolite; No. 3. Andesite.

Samples from G. E. W., of Los Angeles, are rock-soap or soapy clay, a hydrous silicate of alumina, but the composition varies.

The rocks from Berlin, Nye Co., Nevada, are: No. 1. Epidote; No. 2. Garnet; No. 3. An altered aluminous rock incrusted with halloysite; No. 4. Impure magnetite.

The specimens from J. B. G., of Dragoon, Ariz., are: No. 1. Quartz, the brown color being due to the oxide of iron; No. 2. Quartz and limonite with a small amount of yellowish lead carbonate in cavities.

The dark mineral in the specimens from Gibbonsville, Idaho is limonite (iron oxide); no tinstone in any of the pieces. The yellowish-gray pieces are aluminous-rocks—probably altered dike rock of some kind.

Rocks from Weiser, Idaho, marked E. W. S., are: No. 1. Decomposed slate; No. 2 and 3. Decomposed granitic rock; No. 4. Silicious limonite; No. 5. Mixture of garnet, feldspar, hematite, quartz, and chlorite, presumably a gneiss; No. 6. Quartz; No. 7. Schist with vein of dolomite containing pyrite and a coating of yellowish brown limonite.

The rocks from Callahan, Cal. marked C. O. T. are: No. 1. Quartz, semi-crystallized. It seems to be nothing out of the ordinary, greatly resembling the white half-crystallized quartz usually found in gold pocket mines of California. No. 2 is a fine granular quartz rock stained dirty grayish green by chlorite and copper carbonate. A little copper-iron sulphide is disseminated in the rock.

The ore from Salt Lake marked L. M. & M. Co. is quartz containing probably 20% iron sulphide, the greater portion of which is so finely disseminated as to appear amorphous. The ore is in a state of semi-decomposition and contains sulphates (iron and lime). Carbonate of lime is also abundant as a white incrustation. The bright metallic surfaces of pyrite are caused by movement within the rock, causing slickenside.

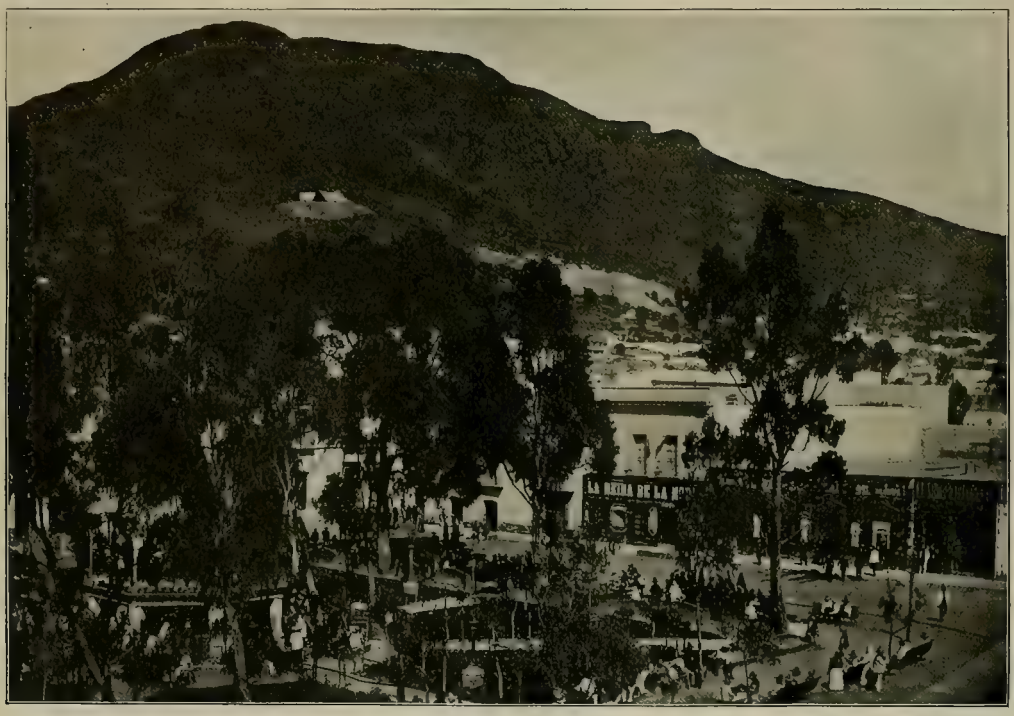
COAL IN ALASKA.—At present the enormous coalfields of Alaska are hampered by lack of transportation facilities, but the disadvantage will be removed partially in a few years, when the present program of railroad construction is completed. The Bering river coalfield near Controller bay, on the Pacific coast of Alaska, includes 25 miles of anthracite and 45 miles of semi-bituminous coking coal. The seams are numerous and very large, several exceeding 20 ft. in thickness. The Matanuska river coalfields, from 30 to 75 miles northeast of Cooke inlet, cover an area of at least 75 square miles. These deposits, which also include anthracite and semi-bituminous coking coal, will soon be tapped by the Alaska Central railway making connection with Resurrection bay on the Pacific coast. No comparison can now be made as to merits of these two coalfields as so much depends on the peculiar local conditions. The high percentage of fixed carbon (about 81%), low ash, and sulphur contents give these districts the essentials for development in future years into valuable mining properties.

Three Weeks in Mexico---X.

Pumping Methods at Pachuca.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Near the summit of the ridge, at Hiloche, where the Pachuca road descends to Real del Monte, there is a fine grove of primeval oak, suggesting the forests which covered the plains and hills of Mexico before the Spanish conquest. A good purpose is shown in the young plantation of cedar and eucalyptus that has been started in this locality. Mexico has suffered enormously from de-forestation, and the laying out of trees ought to be one of the first duties of the Federal and State authorities, as well as of public-spirited citizens. At Hiloche is the big pavilion built in 1901 for the entertainment of 600 people, constituting a party of the American Institute of Mining Engineers. That occasion is remembered by a great many who are now scattered over the mineral regions of North America. The pavilion has not been demolished; it is used for picnics.



The Plaza at Pachuca.

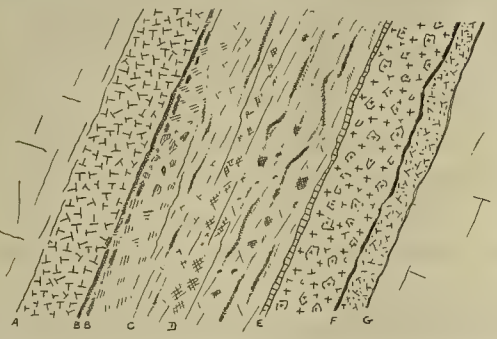
Descending by a winding wagon-road we soon reached La Difficultad, at an altitude of 2,793.27 metres. This mine is one of the chief openings of the Real del Monte company. It affords, among other things, an interesting example of pumping practice. In the shaft-house there is an enormous engine of the marine type built by Richard Hartmann, of Chemnitz (Austria) in 1889. This operates two stationary Rittinger pumps, with 890-mm. discharge and 2.5-m. stroke; also a sinking pump of the same kind with 850-mm. discharge and 3-m. stroke. The capstan engine for handling heavy pieces of pump and facilitating repairs is from Tangye, at Birmingham (England). These pumps have been replaced recently by a new Swiss pump, but they are kept ready in case of need. The Swiss pump comes from Sulzer Bros., at Winterthur; it has a capacity of 8,400 litres per min. to a height of 240 m., delivering the water from the bottom, at 540 m., to a drainage level at 300 m. below surface. The pump was installed on July 23, 1905; it has four compartments, alongside, the water being forced from one into the next, each pump re-inforcing the other. It is operated by a 650-h.p. motor working with 380 h.p. and was taking about 4,000 litres at the time of our visit. The motor of this rotary pump was supplied by Brown Boveri & Co., of Baden, and is of the three-phase induction type. It is constructed to yield 650 h. p. at 60 cycles or 900 rev. per min., using 160 amperes at 1,100 volts. The pump-shaft is coupled direct to the motor-shaft. The motor was running at only two-thirds its normal speed, yet it was heating rather badly; this is characteristic of most Swiss motors. Although Swiss and German motors are cheaper, they have got no stamina and will not stand an overload like the American-made machines, some of which are actually guaranteed to carry an overload of 25 per cent for two hours or even longer. No suction is used, the pump draws from a dam that affords a 50-ft. head. The pressure in the column is 25 kilo. per cm. The sump under the rotary pump is three metres deep, the water from it being raised to the dam by a Knowles pump geared to a motor which gets its impulse from a Koerting elevator, operated by a stream of water descending from the 300-m. level. These Swiss centrifugal pumps are used in other mines at Pachuca and they are said to be highly satisfactory; they have a particular arrangement of the runners which is effective; the makers of them are willing to guarantee a specific efficiency, which, as yet, American manufacturers will not do. Four of these Sulzer pumps (each of 1,500-gal. capacity) have been ordered for El Oro mill, to raise the return water and solution from below the zinc room. At the pump station there was the usual shrine with lighted candle on each side, and ornamented with artificial white flowers.

The first 50 ft. of the shaft is lined with masonry supported by arches sprung from the country rock. The shaft is not continuous; from the 440-m. level there is a counter-shaft to the bottom. This is descended on a cage with steel-rope guides. At the 440-m. level there are

some large underhand stopes; when the flat cable is worn out, its separate strands are used for hoisting ore underground, in hides that hold 25 kilo. each. These are not made in the shape of buckets, but they are laid flat, the broken ore is put on them and then they are laced so as to make a parcel. The ore hoisted by windlass in this way is discharged into side-dumping cars, which are run on a wooden track lined with an iron band, to the station at the shaft, where it is dumped onto a platform to be shoveled into a skip. Altogether, it afforded a curious mixture of old and new methods; it was a hybrid practice. At the 463-m. station we changed from the countershaft to the main shaft, and while waiting for the cage we watched some men who were loading the accumulated waste into ox-hides; these held 300 kilo., or the third of a ton, and after being laced they were hung by chain to the bottom of the cage, the material being used at the next level for filling. All the rock broken in shaft-sinking is raised in this way, and even water, just as they did in the days of Pedro Terreros. As the five men filled and then laced the raw hide, they put it aside for the next trip of the cage; when I first saw it, I thought it was the carcass of a dead mule, and it smelt like one.



A Mexican Ox-team.



In walking through the workings, one notices that the cross-cuts are walled up, the walls being often sealed with clay to direct the ventilation. There is a good deal of masonry in the mine, and different parts of it are shut off by iron gates, so as to prevent pilfering of ore. There is no timbering worth mention. The ore is mainly quartz; it is often ribboned by the banding of rhodonite and sulphides (iron pyrite and argentite); on the whole it reminds one of the veins in the Alice and Lexington mines, at Butte, Montana. The accompanying sketch of the Santa Inez vein is a fair example of the lodes in La Difficultad mine. Both walls are well defined; on the foot (*G*) there is a wet slip; *E* is a band of rhodonite; *D* is mainly amethystine quartz; *F* and *B B* are sulphide streaks; *A B* is massive poor quartz; *B* to *C* is mottled by brecciation; between *D* and *E* there are streaks and spots of sulphide, including argentite, a little galena, and occasional yellow zinc-blende; *E F* is brecciated andesite, now partially silicified; *F G* is crushed quartz. The whole width of lode is seven to eight feet. At the Difficultad mine, the low-grade ore left on the dump is said to contain 400 gr. silver and 2 gr. gold. This affords an idea of the cost of working. At the Barron mine, the ore is said to average 800 gr. silver and 4 gr. gold, while in the Difficultad it is said to carry, for an average of eight metres, not less than 1 kilo. silver and the usual proportion of gold.

It may be added that the prevailing formation about Pachuca is andesite; the veins are lines of fracture which have been healed by silicification. There exist in the district several islands or caps of basalt connected with vents and there are dikes of rhyolite accompanied by slight mineralization along their walls. For details of the geology, the reader is referred to a valuable paper by Señor Ezequiel Ordoñez.*

On leaving Real del Monte by the southern road, one obtains a good view of the surrounding country, by looking back. To the left is a rounded ridge clothed with groves of oak; to the right, a conical hill surmounted by a coppice of dark oak and cedars of Lebanon, and under their shade the white-walled English cemetery where many a Cornishman has gone underground for the last time. Between these flanking hillslopes, framing a pic-

*'The Mining District of Pachuca, Mexico,' *Transactions* Amer. Inst. Min. Eng., Vol. XXXII, pp. 224-241.

ture, there are the white houses and red roofs of the town, surmounted by Moorish church-towers, among which, curiously out of place, is the Cornish engine-house with its lofty chimney rising above the castellated enclosure of La Difficultad mine. Behind the town are green hillsides, and further back, after the interval that marks a deep *barranca* or gorge, there stands, outlined against the blue sky, the mountain which is crowned by the battlemented rocks of Zumate.

When the road crosses the summit and begins the long descent to Pachuca, there is much to be seen that typifies the Mexico of today. The broad and winding road cuts through gray-purple andesite; it is lined with massive stone culverts and does credit to the engineers responsible for the construction. It skirts brown hillsides, darkened in spots by the wild *maguey*, whose tall central stem is the sign of an uncultivated condition; there is an occasional cactus and a few palms, mainly the *izote* from the fibre of which are made the straw hats of the *peones*. Whitewashed monuments dot the surface and, in their occasional sequence of direction, mark the boundaries of mining property. Yellow scrub fringes the road and enhances the value of the purple in the distance. A flock of sheep, a string of patient donkeys laden with charcoal from the forests, other *burros* coming from the valley and laden with pigskin bags inflated with their burden of *pulque;* some sad-faced Indian women trudging up hill, one of them with a baby slung in her *reboso*, another walking patiently while her man rides alongside on his mule; then a cavalier with wide *sombrero* and gaily caparisoned saddle, a *serape* thrown over the silver-mounted pummel and riding his horse superbly; a wagon heavily laden with sacks of ore, its brakes crunching noisily, drawn by ten mules, with silver bells, and driven by a brigand-like muleteer—all these are part of the stream of life that we pass or meet on that road. But the foreground is not all the picture; at our feet, to the south and west, lies outspread the vast plain known as the valley of Mexico, crossed by white streaks of dusty road, checkered by squares of cultivation, the yellow patches of maize, the green of barley, and the occasional darker shade of alfalfa, with other rectangular lines that mark the serried rows of *maguey*.* Sunlight and shadow shift over the vast expanse; in the distance, more than 16,000 ft. high, rises the snow-crest of Ixtaccihautl—'the white woman'—partially veiled in a cloud, and by the Aztec name recalling the pathetic fate of an ancient race. In middle distance there is a blue ridge behind which is Mexico City, and to the right, under the mountain of San Christobal, hides the dusty town of Pachuca; in between are several famous mines—Corteza, El Lobo, Santa Gertrudis, Barron, and La Blanca—each in its walled enclosure and dominated by a towering shaft-house of stone. And then, before we realize it, we are awakening the echoes of the narrow streets of Pachuca, and amid the crackling of our *cochero's* whip and the shouts of those who get out of our way, we pull up at the railway station just in time to catch the train for Mexico City.

THE mechanical equivalent of heat has now been determined with an accuracy of one part in 2,000. At Greenwich, England, 777.7-ft. lb. is the equivalent of the amount of heat required to raise one pound of water through 1° on the hydrogen scale at 63.5° F. Our advance in scientific knowledge is a function of accurate measurement.

*There is no *maguey* on the west coast of Mexico, only one-tenth of the population of the entire country drink *pulque*, chiefly in Mexico City and its vicinity, including such mining towns as Pachuca and El Oro. It is unwholesome because it is drunk when still in process of fermentation; if the people did not take this stimulant they would take some other.

The Reduction of Quicksilver Ore.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK J. BOOTH.

Scattered over the quicksilver districts of San Luis Obispo county—and I mention these districts merely through more thorough acquaintance with them rather than with any idea of comparison in mind—lie the deserted and dismantled remains of half a dozen pipe-retort furnaces, the bleaching bones of the last revival of quicksilver mining in that district. With the cooling of the pipes at the Little Bonanza mine recently, retort reduction ended in that district. It will probably remain so until another rise in the price of quicksilver adds new vigor to a rather disheartened industry.

Although, in the none too extensive literature on the metallurgy of quicksilver, the system of pipe-retort reduction has been largely ignored, still the large number of practical applications of it certainly warrant some discussion. This contribution is intended to be merely a general criticism, based on a working experience with retorts, and is written in the hope that it may possibly prevent some of the disasters in the future that have so characterized its application in the past.

Low in cost of installation, the pipe-retort is fundamentally a prospector's plant, and as such, even with its low capacity and high cost, it is efficient. With but few doubtful exceptions, it has never been operated successfully as a permanent reduction system. Even in these exceptions, the success has only been relative, since the ultimate profits would probably have been greater with other reduction methods. As but few gold mines can long stand the drain of an arastra as a crushing machine, so even fewer quicksilver mines can long endure a retort system. Both involve the sacrifice of all the low-grade ore in the mine, in order that the high-grade ore may be worked, at a higher expense than if all of the ore were worked together.

Retort reduction is essentially a simple distillation, in which the mercury vapor is kept separate from the flame and smoke of the fire-box. This is the chief difference from the principle of furnace reduction, where all the gases enter the condensers together. The isolation of the mercury vapor greatly assists its liquefaction by reducing the volume of gas nearly five times, and simplifying its composition.

Theoretically, retort reduction should have perfect efficiency, but this is never reached. Few operators have any idea of what their recovery is, but it seldom exceeds 75%. The plant is operated by one man who must do heavy, disagreeable work, and at the same time be keen and experienced enough to understand his retort and keep the heat, charges, and condensers properly regulated. The difficulty in finding and keeping such men on the job is its greatest drawback, and the chief factor in its efficiency. The steam from moist ore interferes with condensation by heating the condensers and some ores burn more easily and better than others; all of which influence the success of the operation.

The efficiency and capacity of a retort are linked together and are dependent on many of the same factors. In ordinary practice retorts are built with 12 pipes, one of which is charged every hour, thus allowing the charge to 'burn' for 12 hours. Some highly pyritic and rich ores will not burn out in this time, and are left for 24 hours. The unburned ore or a 'green' charge is easily detected in the daytime by white fumes about the mouth of the pipe and on the lid, and at night by the pale blue flame of sulphur and mercury. The ordinary charge is 125 lb. per pipe, or about 1½ tons per 24 hours for the retort. This charge is dependent on the heat maintained, richness of ore, character of ore—as to sulphur,

size of pieces, and amount of moisture—and must be determined by practice in any case. Sometimes the addition of lime, ashes, or iron borings will assist the burning by taking up the uncombined sulphur. The pipe is usually only filled about one-third full, thus leaving sufficient air to take up all the sulphur resulting from the breaking up of the cinnabar. Highly pyritiferous and very rich ores will produce an excess of free sulphur thus:

$$HgS=Hg+S \text{ and } FeS_2=FeS+S.$$

Quicklime is the best absorbent for this, thus:

$$4S+4CaO=3CaS+CaO, SO_3.$$

In case of uncombined sulphur remaining in the pipe, it will re-combine with the mercury as cinnabar about the entrance to the condenser pipe and, in extreme cases, choke the latter.

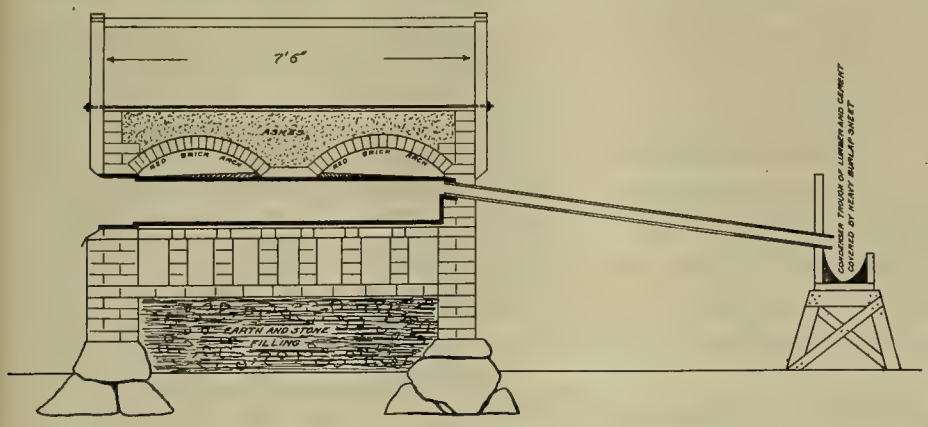


Fig. 1.—Retort Furnace for Quicksilver Ore. Cross-section.

Perhaps there is no part of the retort so vital as the fire-box, and no factor in the efficiency more important than the heat regulation; and certainly no part of it is more abused and less understood. Most retorts have fire-brick grates, and, where these are carefully constructed of arched brick and securely tied to prevent spreading, they are superior to iron grates. Still, in practice, they are seldom able to stand long under the rough usage they receive in firing with crooked, heavy cord-wood. I have used grates successfully, but they are easily burned up by lack of care in raking them. The retort requires a slow draft for burning fuel economically, and there is great temptation for firemen to cut down the draft by allowing the grates to choke rather than by use of dampers. A deep ash-pit kept nearly full of ashes and coal heats the air before admitting it to the fire-box, and will save much wood. A low slow heat is superior to a high one burning the ore quickly, both as to the recovery of the mercury and the life of a retort. I have seen a bench of twelve pipes burned out in two months, and again I know of others that are in fine shape after two years' continuous use. Theoretically, the heat should not go much above 400° C., cinnabar distilling at 375°. In practice the ore should show red in the back half of the pipe by daylight, barely showing any red when falling from the pipe to the wheelbarrow. At night the pipe should show a strong red from end to end, but never any white heat.

Usually the retort consists of 12 independent units all heated from one fire-box. These units are cast-iron pipes six feet long, with an eight-inch bell at one end and an opening at the other to receive the condenser pipe. They are usually 10 in., inside diameter, and 11¾ in. inside the bell. They weigh from 500 to 700 lb., according to thickness. The open end is sealed by double lids, luted on with moist ashes and held tight by bar and wedge. The pipes are laid parallel and level across the length of the retort. The fire-box is placed at one end, the heat passing under the pipes through seven parallel flues and returning over them through two arched flues, thus traversing the length of the retort twice before reaching the stack. The retort is usually divided into two separate sections, front and back, and the heat can be thrown from one to the other by means of dampers in the two upper flues. The pipes are charged with an iron scoop holding 30 lb. of ore and emptied or 'drawn' with a semi-circular hoe directly into an iron wheelbarrow.

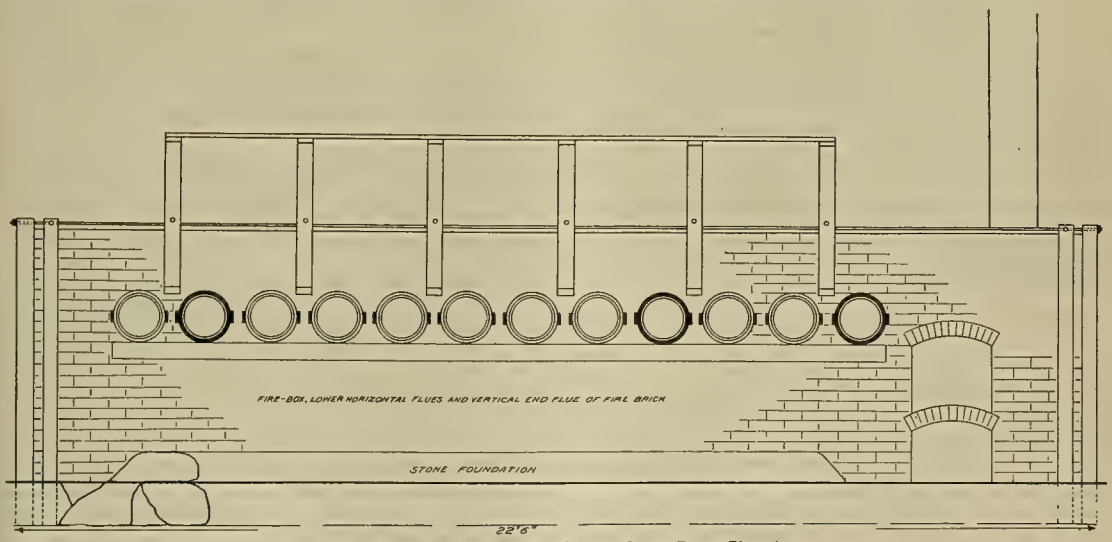


Fig. 2.—Retort Furnace for Quicksilver Ore. Front Elevation.

The condenser pipes are cast-iron, eight feet long and three and one-half inches outside diameter, fixed into the

end of the retort-pipe by a rust joint (sal-ammoniac and iron filings). They are usually given a fall of about 1½ in. per foot. These condenser pipes all feed into one trough, in which the mercury collects and is drawn off every day. The best trough is made from a 'bull pine' log about 12 ft. long. In ordinary practice, a piece of heavy burlap is thrown over this trough and the ends of the condenser pipes. This practice is bad, however, and wasteful as well as unsafe for the retort-men. Still it must not be condemned entirely because the retort at best is a prospector's plant and is often built where lack of water makes good condensation difficult. Many substitutes have been used for the burlap. These usually take the form of closed boxes or chambers of wood or brick, and where water can be used to keep them cool, they are successful. The condenser pipes are kept clean of soot, mercury, and water by means of a small hoe on a flexible steel bar.

This is the ordinary form of the retort, but there are many variations from it. Different conditions—finances, water supply, character of ore and wood, and hobbies of builders—have given birth to as many patterns of retorts as there are of stamp-mills. Some have double fire-boxes, 10 and 20 pipes instead of 12, etc. Some retorts are built with semi-circular pipes instead of circular ones. These economize space and increase capacity, but are more expensive (costing $200 instead of $25), and have but questionable advantage over the round pipe.

In its usual form the retort costs from $1,000 to $1,500, depending on freight, cost, and accessibility of materials. The pipes are usually worth from $25 to $35 apiece, according to weight and thickness. About 6,000 red brick and 2,200 fire-brick with fire-clay are needed in the body; 150 ft. of lumber and 150 ft. of iron rods are used for bracing. A good mason and two helpers can build a retort in ten days.

Two men, each on duty 12 hours, are needed to operate the retort. They are usually paid $2.50 or $3. The work is disagreeable on account of the heat and fumes of sulphur, but is not especially hard. One man can charge and fire two retorts and not work more than 25 minutes out of each hour. Since the capacity of a plant can be doubled without extra labor cost, retorts are usually built and operated in pairs. From 1¾ to 2¼ cords of four-foot wood, according to the kind, are used by two retorts every 24 hours. Running expenses will amount from $10 to $15 per day. The production depends, of course, on the richness of the ore. Saving 75% of the quicksilver in three tons of ore, it amounts to

½% of ore	$11.25
1 % " "	22.50
2 % " "	44.50
5 % " "	112.50

at the present price of quicksilver. Some mines have paid for all their development work from the returns of two retorts, but many mines have been fairly gutted by attempting to run retorts too long.

There is but little more danger from mercurial poisoning or salivation about a retort than any other reduction system. This danger is reduced to a minimum when both men in charge are careful and experienced. New men almost always feel the silver before they realize the necessity of doing their work as it should be done.

With ordinary care a retort burning ore alone ought to last indefinitely, save for the necessary wear and tear on the masonry of the fire-box and about the pipes. In soot retorts and where very high heat is maintained, pipes are often 'burned up' until they leak.

An owner of a quicksilver prospect, having little capital, is usually tempted to install a retort to pay for the development of his property. Where this can be done without injury to the mine, it is a wise move; but where large orebodies of medium-grade ore must be gouged of their rich pockets, it seldom pays in the long run. Where the ore is hard and breaks into pieces instead of crumbling, it can be sorted by hand until it will pay well. In such a mine the ore from development work will often keep the retorts supplied. If the ore cannot be hand-sorted, unless it is very rich—averaging three or four per cent—a retort should never be installed. An owner must know his mine and realize the inadequacy of a retort before he builds it, or he is liable to lose his money and ruin his mine as well.

HYDRAULIC SURVEYING FOR MINES.—The miner's unit for measuring water is the 'miner's inch.' By an inch of water was originally meant such continuous flow as will go through a one-inch square hole, the head of water behind it being usually six to nine inches. This very loose definition has been done away with, but the name still applies, being defined more exactly as ninety cubic feet of water per hour (1½ cu. ft. per min.). In spite of all criticism, the miner's inch has become by custom the standard unit for the flow of water in most mining districts. It no doubt retains its hold on the practical mind because no good definite time or capacity units are in general use, seconds, minutes, hours, and days, or gallons and cubic feet with their clumsy relations to one another, being used according to the whim of the individual. To get an idea of the magnitude of a standard miner's inch, it may be remembered that it is equivalent to a stream one inch square running at a uniform rate of 3.6 ft. per second. This is about a medium speed for small mountain streams; and, with a little practice, the flow of such a stream in miner's inches may be calculated mentally, after rough measurements have been made of the cross-section of the stream and the speed of flow of the water at the surface. The accuracy of this process is within the ordinary limits of fluctuation of the stream from day to day. If the flow has to be recorded over a long period it is well to put in a weir.

For estimating the flow of larger and more important mountain streams, a portion of the stream where the width and flow are comparatively uniform may be chosen and the length of this portion measured and marked by flags. A cross-section of the bottom of the stream is obtained at each flag, and at intermediate points if necessary, by measuring the depth at equal intervals across the stream; from these a mean cross-section is obtained. Floats are started at intervals across the stream opposite the up-stream flag, and timed with a stop watch while running to the down-stream flag; the speed of each float represents the velocity of the stream in its respective longitudinal strip. Each velocity is multiplied by the area of the corresponding portion of the cross-section of the stream, and from the total flow so computed a certain percentage is deducted for the excess of surface over mean flow; this, for ordinary mountain streams, is approximately twice the percentage of the grade of the channel.

The surveying and staking out of mining ditches, flumes, and pipe-lines follow the general practice for this work in other fields of engineering.—From 'The Principles and Practice of Surveying', by Breed & Hosmer.

THE progress of physical science is largely due to the fact that men have gradually learned to lay aside the consideration of unverifiable hypotheses; to guide observation and experiment by verifiable hypotheses; and to consider the latter, not as ideal truths, but as a symbolical language, by the aid of which Nature can be interpreted in terms apprehensible to our intellects.

Metallurgical Accounts.

Written for the MINING AND SCIENTIFIC PRESS
By PHILIP HENRY ARGALL.

The accountancy necessary for a smelter presents difficulties and complications possessed by few other industries. This is due probably to the great amount of figures required and to the fact that such bookkeeping must, so to speak, be double-barreled, a complete system being necessary for the financial portion, and an entirely different one for the metallurgical part, although the former is dependent upon the latter in every detail. The former which comprises the usual phases of ordinary accountancy, need not be described, save as it may come in touch with the metallurgical system, which ultimately must be incorporated in the financial accounts of the company.

The metallurgical accounts of a smelter serve the same purpose with regard to ores and their contents as the financial accounts do with regard to the finances. They show the loss or gain in metals, liabilities and assets of actual quantities of metals received in the ores, the cost of smelting, and of refining per ton, that of parting per ounce; thus affording a comparison of costs and tonnage treated from month to month; of one period with another; and they give an approximate record of each day's work and expenses.

To do this requires a system complete, yet simple and it is in this particular that, perhaps, the great difficulty is encountered. No matter how one may cut and prune and modify, the metallurgical system of any company must, to a certain extent, be cumbersome, and unlike most other instances of 'red tape,' it tends to facilitate methodical work. One of the most important items in the whole system is careful and systematic checking. The necessity of this will be easily understood by a casual glance at the various forms submitted hereafter, many of which are designed so that when the statement is finished the results check themselves; should they fail to do so, there must be something wrong, and the work must be gone over again.

Assuming that we have a complete lead plant for smelting ore, refining the products of the blast-furnaces, and parting the material which comes from the refinery, the question arises how can the cost of each process, or department, be arrived at, and what is the cost of producing the refined products? also, what gain or loss has been made in the gold, silver, lead, and copper shipped, as compared with the quantity paid for on the assays of the company?

With this end in view it is necessary to make divisions, or departments, which are in turn divided and subdivided, under respective headings. Naturally, the first separation is into: 1, Smelting; 2, Refining; 3, Parting. Each department must stand on its own merits, otherwise the results obtained are worthless. If a shipment be made from one department to another, credit should be taken by the department sending it away for the value and total contents as determined by assay, as would be the case if the shipment were made to another company. The department receiving the consignment would accept a debit for the value and contents, but would credit itself with a certain fixed amount for treatment, which would be charged against the department shipping it. Of course, some of the metal contents are returned from one department to another for re-treatment, but that would not affect the first shipment. The department returning such contents in the form of a by-product would get a credit for it in turn, and the department receiving it would accept a debit, but, as in the first case, a certain amount would be charged against the department making the shipment to cover cost of treatment. In this way metal losses in each department would appear against that particular department, and would not, as when treated differently, show against some other part of the plant.

SMELTING.—Under this heading would be shown:

1. Cost of ores sampled.
2. Proportion of labor employed from the time the ore is received until the contents, in the shape of base bullion, are delivered to the refinery.
3. Tools and supplies for handling and treating such ores until their metal contents have been delivered to the refinery.
4. Cost and maintenance of machinery used directly by the smelting department.
5. Proportion of power and lighting used for treating and handling ores until their metal contents have been delivered to the refinery.
6. Roasting, including labor, fuel, etc.
7. Briquetting, including labor, fuel, lime, etc.
8. Smelting.
9. Proportion of miscellaneous and general items used in common by the whole of the plant, such as insurance, watchmen, fire service, tracks, runaways, etc.

The less these sub-headings are again divided the better, as the more they are split up the greater the complications and the more probability of error. However, as it is necessary to ascertain the cost of sampling, the cost of roasting, briquetting, actual smelting, etc., further subdivisions must be made, which will be taken up later in connection with Labor, Time-keeping and Stores.

The following plant forms and statements are proposed for use. On receipt of ore it is, of course, weighed by the sampling foreman, and particulars, such as car number, name of consignor, gross weight, number of bags, tare, net weight, class, etc., should be entered in the Inward or Receipts book, and a carbon copy, which should be taken of each day's receipts, sent to the office first thing every morning. A form suitable for this purpose is shown in Fig. 1.

For use in the office, and for making settlement, the sampling foreman should also fill in part of Fig. 2, for each individual lot of ore. The weights, lot number, number of bags, class of material, marks, name of consignor and car number would be filled in by the sampling foreman; the moisture, assay and analysis would be entered by the chief assayer and then passed on to the office for comparison or settlement. When finished with it, it can be filed away in numerical order, thus making a convenient reference. In addition to turning in the daily statement similar to Fig. 1, and filling in the portion necessary on Fig. 2, the sampling foreman would also be called upon to make out a Daily Operating sheet. This would show the tons of ore, limestone, and ironstone sampled; tons of ore and matte crushed, quantity of ore, etc., delivered to the beds, as well as the number of men employed, and where. A form suitable for the purpose is shown in Fig. 3.

Yard Report.—This is for the purpose of giving the metallurgist a comprehensive idea of what material is in the yard and at call; it is no inconsiderable aid in the work of unloading. With this report before him the metallurgist is able to give orders to unload cars containing material that is required immediately, or those that have been standing in the yard for some time, and against which demurrage will be charged if not released promptly. A form suitable for this report is shown in Fig. 4. This report should be made twice daily at the least; the first time in the morning, to be placed before the metallurgist as soon as he appears at his office; the second one should be made out early in the afternoon, so that the unloading may proceed during the night if necessary, or in the morning when the first gang comes on shift.

These reports can be made out by one of the clerks if the traffic is not excessive, but where it is, a special man is required.

Distribution Sheet.—When lots have been settled for and released, the metallurgist can then proceed to use them in making up his beds or mixtures for smelting. Using a form similar to Fig. 5, he should make a duplicate copy with a carbon sheet, showing the disposition to be made of each lot of ore; one copy of the form would be sent to the sampling foreman for attention; the other would be sent to the metallurgical clerk for entry on his Mixture or Bed sheets.

Roasting Sheet.—Besides giving the sampling foreman instructions each day as to the disposal of the various lots of ore, it is necessary for the metallurgist to give the roaster foreman instructions as to the mixtures he is to roast. This would also be done in duplicate, on a form similar to Fig. 6; one copy would be sent to the roaster foreman, and the other to the metallurgical clerk for his roaster beds. The 'Remark' column is intended to call attention to anything special. It is included in most of the forms, so that shut-downs of furnaces, repairs, etc., can be noted.

Roaster Record.—It is the duty of the roaster foreman

Fig. 7. ROASTER RECORD.

Number of Foremen. ..... Rate of Pay. .....

Date .....

Roaster Number.	Mixture Number.	Material Roasted.	Number of Charges.	Weight of Charges.	Weight Roasted.	From Bin.	To Bin.	Fuel Used.	Men Employed.	Rate of Pay.	Remarks.

Fig. 8. BRIQUETTING RECORD.

Mixture Number.	Roasted Ore.		Crushed Ore.		Slime.		Residue.		Matte.		Lime Used.	Weight of Bricks.	Men Employed.	Rate of Pay.	Remarks.
	Bin.	Weight.	Bin.	Weight.	Bin.	Weight.	Bin.	Weight.	Bin.	Weight.					

Fig. 11. REFINERY RECORD.

Date .....

Receipts Sampled. lb.	Men Employed.	Rate of Pay.
Bullion Slime, etc.		

Furnaces.	Charges.	Weight of Charge.	Time Began.	Time Finished.	Zinc Used. Domestic, lb.	Zinc Used. Foreign, lb.	Materials Produced. Zinc Crust, lb.	Materials Produced. Desilverized Lead. lb.	Materials Produced. Dark Skimmings. lb.	Materials Produced. Antimonial Skimmings. lb.	Gold. Before.	Gold. After.	Silver. Before.	Silver. After.	Fuel Used.	Men Employed.	Rate of Pay.	Remarks.
Blast Furnace Sweater.	1..... 2..... 3..... 4.....																	
No. 1 Softener.	1..... 2..... 3..... 4.....																	
No. 2 Softener.	1..... 2..... 3..... 4.....																	
No. 3 Softener.	1..... 2..... 3..... 4.....																	

Market Lead Kettles.		Retorts.		Cupels.		Antimony Furnace.	
				1 2 3 4 5 6 7			
Weight Charged, lb.		Number in Use.		MATERIAL REFINED.		Number of Charges.	
Time Began.		Number of Charges.		Retort Bullion, lb.		Lb. per Charge.	
Time Finished.		Total Charged, lb.		Base Bars, lb.		Coal Dust Used, lb.	
Refined Lead Produced, lb.		Cupel Bullion Produced.		Slime, etc., lb.		Slag Produced, lb.	
Yellow Skimmings.		Assay. { Gold.		DORE PRODUCED.		Fuel Used, lb.	
Silver. { Before.		{ Silver.		Weight, oz.		Bullion Produced, lb.	
{ After.		Zinc Recovered, lb.		Assay. { Gold.		{ Gold.	
Fuel Used.		Retort Dross Produced, lb.		{ Silver.		Assay. { Silver.	
Men Employed.		Fuel Used.		Litharge Produced, lb.		{ Lead.	
Rate of Pay.		Men Employed.		Fuel Used.		Men Employed.	
		Rate of Pay.		Men Employed.		Rate of Pay.	
Remarks.		Remarks.		Remarks.		Remarks.	

Total Number of Men.	Rate of Pay.		Shipments. Weight.	Shipments. Destination.
		Market Lead.		
		Dore Bullion.		
		Yellow Skimmings.		
		Dark "		
		Litharge.		
		Antimonial Bullion.		

Fig. 1. RECEIPTS BOOK.

Date .....

Car Number.	Lot Number.	Name of Consignor.	Class of Material.	Number of Bags.	Mark.	Weight.			Date Sampled.	Disposition.
						Gross.	Tare.	Net.		

Fig. 2. WEIGHT AND ASSAY SHEET.

Date .....

Lot Number ..... Number of Bags .....

Name of Consignor .....

Class of Material ..... Marks .....

Car Number.	Sampling Foreman's Weights.			H_2O.	Net Dry Weight.
	Gross.	Tare.	Net.		

ASSAY AND ANALYSIS.

Gold .....oz.
Silver.....oz.
Lead .....%
Copper .....%
Silica .....%
Iron .....%
Lime.....%
Zinc.....%
Antimony .....%

Assayer .....

Fig. 3. SAMPLING FOREMAN'S OPERATING RECORD.

Date .....

Work Performed.	Weight. lb.	Men Employed.	Hours Worked.	Rate of Pay.	Remarks.
Ores sampled					
Limestone "					
Ironstone "					
Ore crushed					
Matte "					
Limestone "					
Ore, etc., bedded					

Number of Foremen. ..... Rate of Pay. .....

Foreman.

Fig. 5. DISTRIBUTION SHEET.

Date .....

Bin.	Mixture Number.	Lot Numbers.	Class.	Began.	Finished.	Remarks.

Fig. 4. YARD REPORT.

Date .....

Ores.					Fuels.				Fluxes.			
Number of Cars.	Days in Yard.	Description.	Class.	Condition.	Number of Cars.	Days in Yard.	Description.	Class.	Number of Cars.	Days in Yard.	Description.	Class.

Fig. 6. ROASTING SHEET.

Date .....

Bin.	Mixture.	Class of Material.	Remarks.

Fig. 10. REFINERY RECEIPTS.

Date .....

Lot Number.	Description.	Consignor.	Weight.			When Sampled.	Remarks.
			Gross.	Tare.	Net.		

Fig 9. CHARGE AND SMELTING SHEET.

Date .....

CHARGES.

Charge in Operation.			First Change.			Second Change.			Third Change.			Remarks.
Furnace Number.	Material.	Weight, lb.	Furnace Number.	When to Change.	Material.	Weight, lb.	Furnace Number.	When to Change.	Material.	Weight, lb.	Furnace Number.	When to Change.	Material.	Weight, lb.	
	Bin.....														
	"														
	"														
	"														
	Matte														
	Lead by-products														
	Limestone														
	Total														
	Metallic iron.....														
	Coke														

SMELTING OPERATIONS.

Furnace Number.	Number of Charges.	Bullion Produced.	Matte Produced.	Slag Dumped. Number of Pots.	Changes.	Pressure Recorded.	Men Employed.	Rate of Pay.	Slag Charges.			Remarks.
									Number Smelted.	Slag on Charge.	Coke on Charge.	
1.....												
2.....												
3.....												
4.....												
5.....												
6.....												

to keep a tally of all ore and matte, etc., roasted each day, and to report on form Fig. 7, which would also show amount of fuel used, labor employed, etc., for posting to the Daily Operating Record kept in the office for use of the metallurgist and superintendent.

Briquetting Sheet.—This is somewhat similar to the Distribution and Roasting sheets, and serves but to give instructions to the briquetting foremen as to the lots, etc., he is to treat. The form may be identical with Fig. 6. Copy of this sheet is also sent to the metallurgical clerk.

Briquetting Record.—This report is made out by the briquetting foreman each day, and sent to the office for the Daily Record. A form that has been found to answer is shown in Fig. 8.

Charge and Smelting Sheet.—Everything is now in order for the metallurgist to proceed with his smelting operations. Ores have been sampled, settled for, roasted, briquetted and bedded. He makes up his charges for the day's run, and gives instructions to his blast-furnace foreman in that portion of the Charge & Smelting sheet headed 'Charges.' See Fig. 9. The blast-furnace foreman should follow such instructions implicitly, and no alterations should be made in the operations except on receipt of instructions from the metallurgist as entered on the Charge & Smelting sheet.

The particulars of the smelting operations would be filled in by one of the blast-furnace foremen, and passed on to the office, so that they could be incorporated in the Daily Operating Record.

With the delivery of the resulting base bullion from the blast-furnace to the refinery, the contents of such bullion, as determined by assay, ceases to be a charge against the Smelting department, and becomes a charge against the Refinery, though the Refinery makes a refining charge against the Smelting department for treatment. This refining charge is a matter of estimation, based on the actual cost of treating such bullion from month to month. The contents of the slag tipped over the dump are a direct loss in smelting, and should the operations for any period show a loss of metals as compared with the quantities purchased, a considerable portion may be accounted for as loss in slag. When the operations show a gain of metals the only reason to account for it is, the smelter has received metals which have not been shown on the various records of the company. The resulting matte from the blast-furnace is assayed, and is usually worked up by further roasting and smelting to a grade sufficiently high to ship, to convert to blister copper, or to use in a blue vitriol plant. All matte from the time it is tapped from the furnace must bear its proper proportion of expense. A fixed proportion of the labor of the furnacemen must be charged to it, also all crushing, roasting, and further smelting it may have to undergo. As a certain amount of crude ore is necessary to help in the reduction of matte, an amount according to the percentage of ore on the charge must be charged to Ore account, covering the cost of labor, fuel, flux, and all other charges incurred on such run. In the event of any matte being required to assist in fluxing an ore charge, the matte so used would lose its identity as matte, and any charges for labor, roasting, crushing, smelting, etc. must be a charge against Ore account. The reason for this will easily be seen when it is known that the matte from the run in which such matte has been used as a Flux is but slightly affected. It may be a little higher in grade, but such change would be very slight, and the same process of re-crushing, re-roasting, re-smelting it to a second-grade product has still to be undergone. The charges, therefore, on such matte would be to Ore, as if the lot had come by rail, and had been through the usual procedure of sampling, etc., as with sulphide lots.

The Charge & Smelting sheet is the last of the daily reports turned in by the Smelting department, and with the delivery of the base bullion to the Refinery, we take up that department's operations.

REFINERY.—Costs against the refinery would include:

1. Cost and value of all receipts.
2. Labor employed by the refinery from the time the base bullion is received from the blast-furnace until its contents have been delivered to the parting plant in the shape of doré, or to the smelting plant in the shape of by-products.
3. Tools and supplies used for handling and treating such bullion, etc., until their contents have been shipped.
4. Cost and maintenance of machinery, furnaces, etc., used by the refinery.
5. Proportion of power and lighting.
6. Proportion of miscellaneous and general items used in common by the whole of the plant.

In addition to the base bullion received from the blast-furnaces, other bullion, rich cyanide slime, and other high-grade products, which can only be treated in the refinery, may be received from outside sources. The first sheet, therefore, for the refinery foreman to make up would be his Refinery Receipts, Fig. 10. As in the case of the sampling foreman, he would keep a permanent record in book-form, a duplicate copy of which would be turned in to the office each morning. Receipts would include the base bullion received each day from the blast-furnaces.

All the sampling of Refinery Receipts, excepting the base bullion, sample of which is taken as soon as it comes from the furnaces when it is in a molten state, would be reported on the daily report of operations, and would appear as a charge against the refinery. As with the sampling foreman, the refinery foreman would fill in the name of shipper, number of bars, or bags, brands, weight, etc., on a form similar to Fig. 2, which is to be sent to the laboratory for the assay of the consignment to be added, and then passed on to the office for comparison or settlement.

The refinery foreman's next daily report is shown in Fig. 11, which embraces the refinery operations during the day, showing ounces of doré produced, resulting by-products sent to the blast-furnaces and elsewhere for treatment.

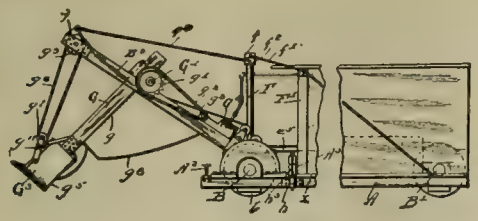
As with the base bullion, which, after delivery to the refinery ceases to be a charge against the Smelting department, so the contents of the doré bullion sent to the parting plant cease to be a charge against the Refinery, and the by-products returned to the smelting department are credited to Refinery when shipped, the Refinery being debited with a treatment charge by the Smelter for treatment of the by-products, and a parting charge by the Parting plant.

MINING IN BOLIVIA.—The search for minerals in Bolivia is attracting the attention of several exploration companies, but, apart from the tin deposits, the results have been disappointing. Gold is obtained on the Rio Grande, where the natives on the beach wash the material which comes down the river. The gullies running into the Amazon valley were worked in ancient times, and in places some nuggets and water-worn gold were found. This place, however, is difficult of access, for there are no roads. Everything has to be transported by Indian carriers, who, owing to the density of the scrub, are compelled to cut their way with knives. The climate is very bad, fever and insect pests being rampant. The Corripata, another tributary, carries more or less gold, but the river is full of enormous boulders and the country is very steep. Some distance down the river the Indians are still in a savage state.

MINING AND METALLURGICAL PATENTS.

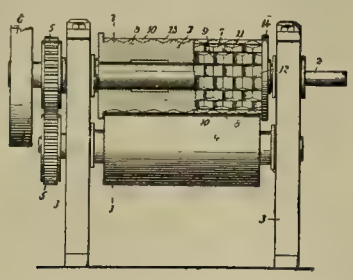
Specially reported for the MINING AND SCIENTIFIC PRESS.

TUNNEL AND MEANS FOR CONSTRUCTING THE SAME. — No. 832,120: Jules Breuchaud, Yonkers, New York.



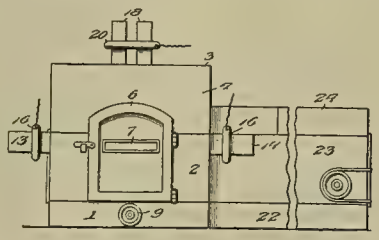
A bottomless pneumatic shield provided interiorly with means whereby foundations may be constructed on or in the bed of a river from within said shield, with means for keeping said shield under water, and with means for advancing the shield horizontally as the foundations therebelow are constructed.

CRUSHING-ROLL.— No. 832,423; José P. Rodriguez, Caibarien, Cuba.



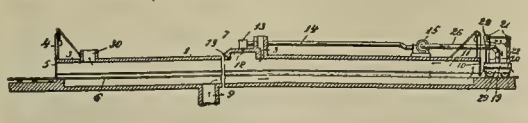
A crushing-roll having teeth formed in straight rows extending longitudinally of said roll, and having straight webs lying between said rows and extending longitudinally thereof.

ELECTRIC FURNACE.—No. 832,511; Edwin A. Storey, Newark, New Jersey.



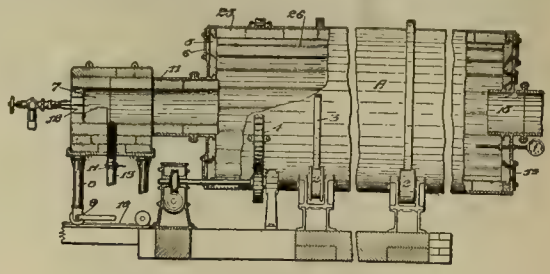
An electric furnace comprising a furnace proper, horizontally-arranged conductors extending through opposite walls of the furnace, a resistor supported by the inner ends of said conductors, and a conductor supported by the furnace and movable in a plane at right angles to the plane of the first-mentioned conductors.

FURNACE FOR CALCINING OR BURNING BRIQUETS OF ORE.—No. 832,358. Filip J. Bergendal, Herrang, Hafverosund, Sweden.



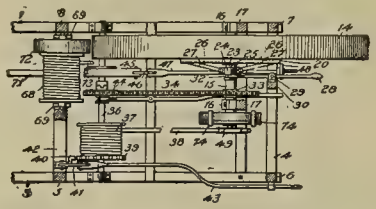
A furnace for the purpose specified, having an elongated main chamber, a combustion-chamber opening into said main chamber at its upper part, an inlet in the upper part of the main chamber for a combustible gas, means for compelling the flow of a current of combustion-air along the roof of said main chamber past said gas-inlet and to the combustion-chamber, and means for injecting into the combustion-chamber, at an angle to the axis of the main furnace-chamber, a current of aeriform fluid for effecting the proper mixing of the combustion-air and gas.

ORE-ROASTING AND OXIDIZING APPARATUS.— No. 832,292; Fessenden C. Butterfield, Oakland, California.



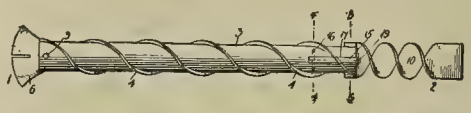
The combination with a revoluble ore-roasting shell having means whereby ore may be admitted thereto, of a combustion-chamber separate from the shell and movable toward and from the inlet end thereof said chamber having an opening in one end for the admission of a gaseous fluid and having an air-supply pipe fixed to and movable in unison with it.

WELL-DRILLING MACHINE.—No. 832,362; Ernest O. Boaz and John Kenehan, Fort Worth, Texas.



In a well-drilling machine provided with a drill, a cable attached to said drill, a spool for said cable, and means for paying out the cable from said spool; a drill-wheel carrying a sheave-wheel for engaging said cable to regulate the stroke of the drill, a ratchet-wheel for driving said drill-wheel, means for intermittently locking said drill-wheel and ratchet-wheel together for drilling purposes, and means for permanently locking said drill-wheel and said ratchet-wheel together.

COAL-DRILL ATTACHMENT. — No. 832,096; James T. Tabor, Athens, Illinois.



A tubular coupling of the class described, having an external spiral feed-thread extending from end to end thereof, and further provided at its inner end with a longitudinal T-shaped socket and a recess intersecting said socket, a latch pivotally mounted in said recess and having a beveled engaging edge, and a spring to normally close said latch, in combination with a bit at the outer end of the coupling and having a stem in the bore thereof, and a feed-bar having a tongue at its outer end in the longitudinal portion of the T-shaped socket of the coupling and provided with an opening engaged by the latch, and shoulders at the opposite sides of the inner end of the tongue, engaging the widened portion of said T-shaped socket.

PROCESS OF SEPARATING METALS FROM THEIR ORES.—No. 832,563; George H. Waterbury, Denver, Colorado.

The herein-described leaching process consisting in placing suitably-pulverized ore in a tank containing a solution composed of water, common salt, alkali-metal nitrate and sulphurous acid, and subjecting the pulp thus formed to the action of air and steam simultaneously introduced.

to keep a tally of all ore and matte, etc., roasted each day, and to report on form Fig. 7, which would also show amount of fuel used, labor employed, etc., for posting to the Daily Operating Record kept in the office for use of the metallurgist and superintendent.

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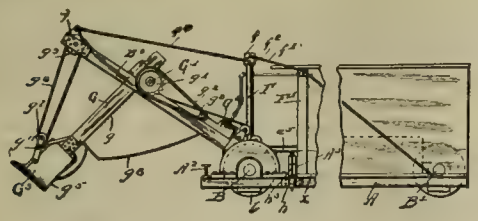
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MINING AND METALLURGICAL PATENTS.

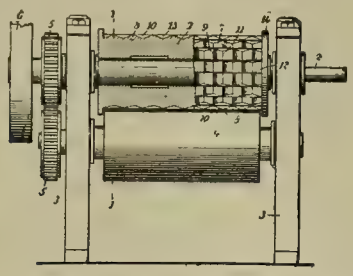
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TUNNEL AND MEANS FOR CONSTRUCTING THE SAME. — No. 832,120: Jules Breuchaud, Yonkers, New York.



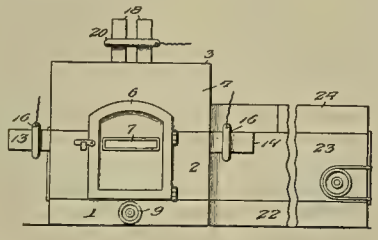
A bottomless pneumatic shield provided interiorly with means whereby foundations may be constructed on or in the bed of a river from within said shield, with means for keeping said shield under water, and with means for advancing the shield horizontally as the foundations therebelow are constructed.

CRUSHING-ROLL.— No. 832,423; José P. Rodriguez, Caibarien, Cuba.



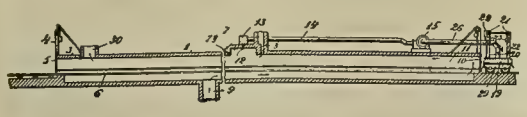
A crushing-roll having teeth formed in straight rows extending longitudinally of said roll, and having straight webs lying between said rows and extending longitudinally thereof.

ELECTRIC FURNACE.—No. 832,511; Edwin A. Storey, Newark, New Jersey.



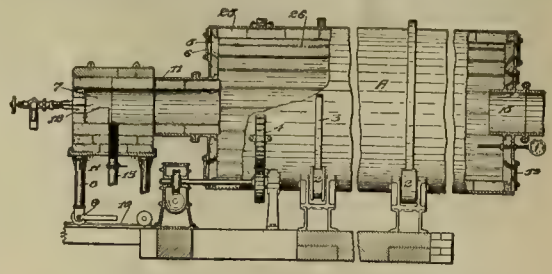
An electric furnace comprising a furnace proper, horizontally-arranged conductors extending through opposite walls of the furnace, a resistor supported by the inner ends of said conductors, and a conductor supported by the furnace and movable in a plane at right angles to the plane of the first-mentioned conductors.

FURNACE FOR CALCINING OR BURNING BRIQUETS OF ORE.—No. 832,358. Filip J. Bergendal, Herrang, Hafverosund, Sweden.



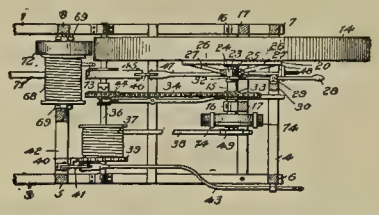
A furnace for the purpose specified, having an elongated main chamber, a combustion-chamber opening into said main chamber at its upper part, an inlet in the upper part of the main chamber for a combustible gas, means for compelling the flow of a current of combustion-air along the roof of said main chamber past said gas-inlet and to the combustion-chamber, and means for injecting into the combustion-chamber, at an angle to the axis of the main furnace-chamber, a current of aeriform fluid for effecting the proper mixing of the combustion-air and gas.

ORE-ROASTING AND OXIDIZING APPARATUS.— No. 832,292; Fessenden C. Butterfield, Oakland, California.



The combination with a revoluble ore-roasting shell having means whereby ore may be admitted thereto, of a combustion-chamber separate from the shell and movable toward and from the inlet end thereof said chamber having an opening in one end for the admission of a gaseous fluid and having an air-supply pipe fixed to and movable in unison with it.

WELL-DRILLING MACHINE.—No. 832,362; Ernest O. Boaz and John Kenehan, Fort Worth, Texas.



In a well-drilling machine provided with a drill, a cable attached to said drill, a spool for said cable, and means for paying out the cable from said spool; a drill-wheel carrying a sheave-wheel for engaging said cable to regulate the stroke of the drill, a ratchet-wheel for driving said drill-wheel, means for intermittently locking said drill-wheel and ratchet-wheel together for drilling purposes, and means for permanently locking said drill-wheel and said ratchet-wheel together.

COAL-DRILL ATTACHMENT. — No. 832,096; James T. Tabor, Athens, Illinois.



A tubular coupling of the class described, having an external spiral feed-thread extending from end to end thereof, and further provided at its inner end with a longitudinal T-shaped socket and a recess intersecting said socket, a latch pivotally mounted in said recess and having a beveled engaging edge, and a spring to normally close said latch, in combination with a bit at the outer end of the coupling and having a stem in the bore thereof, and a feed-bar having a tongue at its outer end in the longitudinal portion of the T-shaped socket of the coupling and provided with an opening engaged by the latch, and shoulders at the opposite sides of the inner end of the tongue, engaging the widened portion of said T-shaped socket.

PROCESS OF SEPARATING METALS FROM THEIR ORES.—No. 832,563; George H. Waterbury, Denver, Colorado.

The herein-described leaching process consisting in placing suitably-pulverized ore in a tank containing a solution composed of water, common salt, alkali-metal nitrate and sulphurous acid, and subjecting the pulp thus formed to the action of air and steam simultaneously introduced.

Rivet Forges of Large Capacity.

The efficiency and consequent convenience of rivet-heating forges depends largely upon their capacity, ease of operation, and portability. The depth of fire must be sufficient to keep the rivets hot for several minutes should the blast be stopped, and the diameter of the bed of hot coals should be sufficient to enable more than one gang to be supplied with rivets, so that the forge may be used for general repair work of a heavier nature. The forge shown in the illustration weighs but 135 lb., and as the parts are readily detachable, being arranged so that they can be assembled in a few minutes, it is admirably adopted for use on tanks, stand-pipes, steel buildings, bridges, and in mines.

The Buffalo Forge Co., of Buffalo, N. Y., has styled this the 625 Series, which comprises three forges No. 625, 625A, and 625B. All of these measure in extreme height 44 in. and are supplied with a fan of 12 in. diam. The fan is



A Rivet Forge.

operated by helical and spur cut gears running in an oil bath, enclosed in a dust- and air-tight case, though the case may be removed from around the mechanism without disturbing the gears, as their bearings are in a frame entirely independent of the oil-case. This design insures perfect alignment and operation of the gears at all times. In this machine no spiral gears are used, as experiment has proved that they do not wear satisfactorily in service of this kind, though their use would reduce the cost. The pinion on the fan-shaft is helical, cut as is the gear driving it, which insures smooth running at all times, because always three of the gear teeth are in mesh at one time.

The tuyere is placed in the bottom of the fire-fan, which is 4 in. deep. The tuyere is in the shape of a ball, enabling the blast to be thrown in any direction to maintain a large or small fire as desired for the work in hand. Should clinker form at this point, a twist of the handle breaks it off and it drops against the clinker gate, whence it may be removed at any time. The fan-wheel is the result of several tests to determine the proper width and slope of tips relative to the cross-section of the casing, and new dimensions have been decided upon which are backed by a substantial guarantee from the manufacturer, the Buffalo Forge Company.

Books Received.

THE MINERAL INDUSTRY during 1905. Vol. XIV. Edited by W. R. Ingalls. *The Engineering & Mining Journal.* This valuable statistical book is welcomed each year by all who are engaged in mining and metallurgy, and their allied industries. This year it contains 730 pages, and is as generous with information as it is rich in statistical data. Another feature of prime importance is the greater promptitude of publication, on which the editor is to be congratulated. The principal reviews come from the experienced pens of W. R. Ingalls, Frederick Hobart, E. K. Judd, Robert H. Richards, H. O. Hofman, and F. W. Parsons. Other important articles have been prepared by specialists recognized as authoritative. In every respect this volume is worthy of the standard established by the first editor and originator of the series — R. P. Rothwell. Vol. XIV is distinctly superior to its immediate predecessors. It forms a compendium of information absolutely necessary to those who are actively engaged in mining and metallurgy, and it will be a valuable addition to any reference library. It is for sale by the publishers at New York, and by the MINING AND SCIENTIFIC PRESS, at $5.

The second edition of *Electricity as Applied to Mining* will be welcomed by those operating with electric power. This book, which so clearly deals with the fundamentals and also gives valuable data as to the cost of the operation and maintenance of electric mining machinery, is from the pen of specialists in mining and electrical engineering, whose joint authorship adds greatly to the value of the book. The whole volume, and especially those chapters in which transmission of power, haulage, and pumping are described, will be found to be full of interesting facts and figures.

The Principles and Practice of Surveying, by Charles B. Breed and George L. Hosmer, Instructors in Civil Engineering, Massachusetts Institute of Technology. Published by John Wiley & Sons, New York. This octavo volume of 526 pages is a textbook on surveying, which includes not only a practical knowledge of the subject, but is also adapted for teaching purposes. The most common mistakes occurring in field-work are emphasized, and every effort is made to afford right methods even in minor details. For this purpose a large number of examples from actual practice are introduced, aided by 192 diagrams. The chapter on mine surveying is by Blamey Stevens, an experienced engineer, now resident in Alaska. The book ought to prove of great usefulness. It costs $3, and is for sale by the MINING AND SCIENTIFIC PRESS.

Commercial Paragraphs.

THE CHICAGO HOUSE WRECKING CO. has just issued Catalogue No. 145. This is the leading establishment of its kind in the world and has accomplished some gigantic operations.

L. F. BEERS has taken charge of the Detroit office of the Buffalo Forge Co., succeeding H. M. Brightman, who is now connected with the Terry Engineering & Construction Co., of Grand Rapids, Michigan.

ROBERT W. HUNT & CO., ENGINEERS, The Rookery, Chicago, have been appointed consulting, designing, and constructing engineers for the new municipal electric lighting plant for the city of Milwaukee, by Mr. Chas. J. Poetsch, City Engineer. This appointment has been unanimously confirmed by the City Council, the site for the plant has been purchased, and work will immediately start upon plans and specifications, the estimated cost being $700,000.

THE HENDRIE & BOLTHOFF MFG. & SUPPLY CO. has just closed contracts for the exclusive sales agency of the King screen. This screen is the invention of Howard G. King, formerly superintendent of the Colorado Zinc Works, at Denver, and one of the best known millmen in the State. The screen has been in practical use for about a year, and has proved such a success that Mr. King has resigned his position at the zinc plant and will hereafter devote his time to the manufacture of this screen. Circulars and printed matter will shortly be ready for distribution. The screens are on exhibition at the main office of the Hendrie & Bolthoff Company.

THE CHICAGO PNEUMATIC TOOL CO. reports that up to Oct. 25 orders booked had exceeded orders for first 25 days of October, 1905, 40% and an increase over September of 37%. The amount of business done for the first nine months of the current year has shown an increase of 27% over corresponding period in 1905. Notwithstanding the fact that the Chicago Pneumatic Tool Co. had on their books at the close of the year 1905 an excess of 8,000 active customers, they have added to this large list during the first nine months of the current year over 1,500 more customers, which indicates clearly the rapidly increasing popularity of the company's product and the extent to which they have been able to broaden the field for their tools and appliances generally

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Editorial.

THE CALIFORNIA MINERS' ASSOCIATION will meet in annual convention in San Francisco on December 3. The session will last four days. It is intended to enlarge the scope of the association and make it thoroughly representative of the mining industry in California.

THE FIRST SHIPMENT of zinc ore from Washoe county, Nevada, was made recently to the smelter at Iola, Kansas. Antimony ore of good grade, and free from arsenic and lead, is being mined near Mill City, in Humboldt county. Nickel, as is well known, is produced at Lovelocks, also in Humboldt. These facts are suggestive of the variety of mineral resources possessed by a State that until recently was supposed to produce silver alone, and is now the scene of the greatest excitement in gold mining.

LEAD ORES are becoming scarce in Colorado and Utah. Leadville now yields an excess of pyritic material and only a small proportion of lead, mainly carbonate ore from the gleaning of the old workings. In Utah the lead used to come from Bingham, Park City, Stockton, and Little Cottonwood. Bingham is now a great copper district, and one almost forgets that it once supplied a large tonnage of lead ore. The Yosemite was especially productive in this respect, for it was of the lead sulphate which came from this mine that George Hearst said: "You could melt it in a frying pan." As a collector of the precious metals in smelting, copper has replaced lead.

THE COPPER MARKET continues strong and healthy. Consumption in the United States is fully up to the production of the metal. Scarcity of labor is curtailing the output of many mines. The shipments from Chile are less than last year, and the visible supply in England is considerably less than twelve months ago. Spain and Australia have increased their exports, so also has Japan. But the Japanese production is small, while domestic consumption there is increasing rapidly. The directors of the Rio Tinto Company stated recently that the indications point to a continuance of high prices in the copper market, and that consumption all over the world is increasing at an even more rapid rate than the output. This appears to be justified.

A MINE PROMOTER named Whalen was convicted this week in California of salting a mine in Nevada. He was sentenced to ten years. The Judge said: "This thing must stop. It is worse than highway robbery. I have more respect for a highway robber than for a man who goes about with an air of respectability swindling poor people." It is time the community in general shared the Judge's opinion. The transfer of cash from one person to another by means of plausible mis-statements is considered clever by many people who regard a

hold-up at night as a disgraceful occurrence. The daily press is full of invitations to buy stock in prospects that are described as producing mines. Several of our local newspapers continue to publish the offer of shares in the invention of a man who has a cold-storage motor that will do impossible things and who undertakes to make poor people rich, that is, to take from them the small earnings of a lifetime in return for worthless paper. The publishers of these papers know that it is disguised robbery, and yet they do not hesitate to accept the advertisement, because they are paid for it. For these men, also, we have no more respect than for highway robbers.

Railroad Building in Nevada.

Nevada evidently is destined to be well served by railroads. Soon there will be a through service of trains from Las Vegas on the Los Angeles & Salt Lake railroad, in the southwest corner of the State, to the Southern Pacific, both at Reno and at Hazen. Last month the new railroad from Cobre, on the Southern Pacific, was opened southward to Ely and now we hear that another branch line is to be built from Tintic Junction in Utah to Deep Creek in western Utah, which will help those who want to prospect in eastern Nevada. It is probable that a short length of railway will soon connect Pioche to Caliente, on the Los Angeles & Salt Lake line. Finally, we have good authority for the belief that a railroad will be laid down between Ely and Goldfield, across the very heart of the gold regions of the desert. What we need next is a direct outlet to the Coast, more particularly San Francisco. It is rumored that W. A. Clark has purchased the control of the Ventura & Bakersfield Railroad, known as the Burson line, and that he will extend it to the Coast. This road seems to be too far south to be of any advantage to San Francisco, and as we are to have important copper and lead smelters on the Bay, it appears likely that more direct communication will be secured with the new goldfields, through the Sierras, somewhere in the northern part of Inyo county, California, and across the boundary into Nye county, Nevada. The silicious gold ores of western Nevada and the pyritic copper of Shasta county, California, must be smelted on the Bay of San Francisco.

Gratuitous Advice.

Most mining engineers give a great deal of valuable advice for nothing. They cannot help it. Their friends and acquaintances think it proper to take up their time and to get useful hints on mining shares and on technical matters, without any question of payment for services rendered. Doctors and lawyers are not imposed upon in this way; their professional status is honored, the trespass on their time is properly debited in fees, however small. Any mining engineer, geologist, or metallurgist living in a large city and possessed of an average acquaintance will donate thousands of dollars' worth of advice per annum to those who thus impose on his good nature. It is time to stop the practice. Let professional men adopt the idea of making a small charge—$5, $10, or $25, as the case may be—for all replies to questions bearing upon mining speculation, management, machinery, processes, and other subjects of commercial importance. If adopted, such a method would save the engineer from the importunity of those who are not serious or who are mean, while it would encourage many men to get advice who now feel that they must either engage an engineer at a big fee or be guilty of an imposition by asking something for nothing. We have spoken of this matter before, and we are prompted to refer to it on this occasion by reason of the receipt of a circular letter from a reputable—almost celebrated—mining engineer at London, who offers to give five replies concerning the merits of mining ventures for two guineas, and will give an unlimited number of replies for five guineas. To the letter is attached a form of subscription, covering the proposal described. He is simply asking pay for doing what he and others have all along been expected to do for nothing.

Mining in Korea.

All of those who have any knowledge of political conditions in Korea, will not be surprised to learn that the new Mining Laws discourage the investment of foreign capital. The policy of the Japanese has been pretty frank from the beginning, namely, to exploit Korea for themselves. By the courtesy of the editor of *The Korea Daily News* we have been enabled to read the mining regulations recently issued and the reading of them sustains his conclusion that unless they were drafted by a humorist, their intent is to prohibit foreign investment in Korean mining enterprises. Article No. 10 provides that no mining right may be sold, assigned, or mortgaged without the consent of the Korean Minister for Agriculture. Article No. 21 states that the Korean Government will not be responsible for the actions of this Minister; while Article No. 27 stipulates that the Minister may make no transactions with foreigners without the consent of the Residency General. As the Residency General represents Japan, while at the same time the Japanese Government has declined to make itself responsible for acts against foreigners committed by the Residency General, there is a game of hide-and-seek which serious investors will not find amusing. In the meanwhile the administration of mining is placed under the Korean Minister of Agriculture, and that eminent farmer will be the scapegoat in case of dispute, while at the same time serving as a convenient tool in the hands of the Japanese, if there be any who wish to exploit the mineral resources of Korea. As the Japanese have but little capital available for outside enterprise, it is not likely that Korea will be developed with any notable rapidity.

Nor need we be anxious about it, for there are ample opportunities for the use of money in mining regions much nearer home. At the present time the Western States of America afford a splendid field for capital from both sides of the Atlantic. There is a proverb that says the oxen farthest from home have the biggest horns. Distant mining districts often cast a glamor that is deceptive. Mining, like charity, should begin at home.

By the Way.

At a recent meeting of the Schenectady branch of the American Institute of Electrical Engineers, an address was delivered by Mr. T. Commerford Martin, editor of the *Electrical World*. He said, in part:

It sounds almost heretical to express the idea that a modern man can live without a daily newspaper, but Lord Kelvin once allowed to me that he virtually did so without cheating his brain. The placard bulletin, the megaphone, the ticker tape, and the sky signal-lights could keep one fairly *au courant* with all the news of plague, famine, and sudden death that is necessary to happiness. But it is hard to conceive how a man desirous of keeping abreast of invention, improvement, experience, and discussion in his profession or industry can possibly do so if he does not read with at least moderate diligence his technical paper. Even the worst trade journal is better than none; and the best will leave a true hunger for knowledge sorely unsatisfied. The technical journalist is a specialist, he is cultivating a restricted territory, he is working with a microscope, all of which tells against largeness, broadness, liberality. Yet, intensified cultivation has its merits, and many a patch of lilies in Bermuda, or vines in France, yields a far more valuable product than a sprawling wheat farm in Minnesota with its thin 15 bushels per acre.

No technical man can find outside his special class journal the right intellectual food—tough, indigestible, and badly cooked as most of it may be. The efforts of the daily press to be technical and supply valuable data, are laudable; the engineering supplement to the London *Times* is the best example of how far such a tendency can go; and the synopses given in many American journals of scientific and industrial news are praiseworthy from the standpoint of the average reader. But much of what gets into print thus is to be regarded with suspicion, though reflecting no discredit on the daily whose pages it brightens. Now and again there is a book in the nature of a revelation, but the majority of the text-books, in our schools and on our shelves, are years behind the latest things going. These facts the student, in college or out, must get from the technical press. Being often asked for the latest book on a subject I have been struck with the frequency, the invariability with which one's recommendation unavoidably carries with it a number of articles recently printed in the technical press.

When I meet a young engineer and discover that he has, unless for some valid reason, failed to join the national or local society of his branch of engineering, I find myself involuntarily putting a black mark against his name. When I discover also that he does not read regularly the journals of the art, he becomes more hopelessly 'conditioned' in my mind, as one without professional pride and dignity, and as one who on his own confession does not keep himself so informed about progress that he can be properly useful in the world.

I have been formulating a plea or reason for the existence of technical journals as the clearing houses of current knowledge, as a necessary tool, as a means of intercourse, without any implication that any one of them is all that might be expected of it. Every human institution is branded with imperfection, and it is only of late years that most technical journals have even begun to attack the tasks before them or discharge the responsibilities resting upon them. Aside from the conceded inadequacy of the editors and managers—nowhere more painfully realized than among themselves—two very great difficulties steadily prevent these luminaries from being of full candle-power. One of these is the inability to find men who have a story to tell and who can tell it well. The other is the reluctance of corporations and individuals to make public for common benefit the information acquired primarily for themselves in dealing with a subject, and often at enormous expense. Both these are evils and may be glanced at separately.

It may appear curious in these days when it is supposed that everybody writes to complain that there is not writing enough. Lady Holland once said to Lord Porchester: "I am sorry to hear you are going to publish a poem. Can't you suppress it?" And when one wades through the countless popular magazines, and the endless Sunday newspapers, and realizes how many beautiful miles of the forest fall daily under the axe to supply food for the ravenous presses of the age, it does seem as though the whispering trees would be better than so much loud talk. But as sinners against the Adirondacks, the technical papers are venial offenders with their little editions, when compared with 'yellows' boasting half a million copies daily, or 'muckrakers' running a million per month. Those outlets for the productions of the intellect are always clogged with copy, but the technical journals in reality have little offered them voluntarily, and are frequently at a loss to get the right man to deal with a topic. For some inexplicable reason, the phrase 'an officer and a gentleman' does not find its equivalent in 'an engineer and an author,' although the engineer almost daily has an experience or an observation which, if duly recorded, would be of value and economy to every one else in the same field of work; and even if the single fact is of little utility, a number of them might permit the generalization out of which great truths and great inventions would presently emerge.

If the technical journals could get more of these articles, they would pass in glad silence over the fact that the authors knew little of prosody or syntax, and have never used any but 'simplified spelling.' The great want of the time is, indeed, the ability to observe and then tell clearly and directly what is seen. This whole great electrical field of ours teems with obscure phenomena, with hints, suggestions, ideas, so that if a man notes something and does not know himself how to make use of it he can at least be useful by passing it on. There may be an improvement or a refinement in the art involved in the merest trifle; there may be the germ of a great invention. Chiefly thus does the improbable or the impossible become the prosaic and commonplace. "Numerous attempts have been made," said Herbert Spencer in his treatise on Education, "to construct electro-magnetic engines, in the hope of superseding steam, but had those who supplied the money understood the general law of the correlation and the equivalence of forces, they might have had better balances at their banks." These very works are building yearly thousands of dynamo-electric machines that supersede steam in every branch of industry, but the process of their creation since Spencer wrote, down to the moment when No. 6,000 went on the Central tracks, has been one of almost imperceptible gradations of advance; and each advance has involved one closer observation of the conditions and facts to be dealt with in solving the problem. Such data are the very pith and marrow of the technical journal, and while I yield to none in profound admiration of the creative inventor—Edison, Thomson, Rice, or Steinmetz—I become more and more convinced that in large measure the magnificent growth during the past century in the arts and sciences is due to the swift printing and circulating of new knowledge, which even to the genius is stimulating food for thought. In other words, the technical journal is an essential tool of professional, industrial, and commercial life.

Special Correspondence.

London.

Cornish Mining News.—High Bank Rate Does Not Stop Speculation.—General Activity in Mines.—Zinc Corporation Increases Its Capital.—Reports from Esperanza.—Farish's Report on Dolores.—Good Work at the Camp Bird.

A large attendance of smelter and mine representatives is reported at the Cornish 'ticketing' last week. The average price per ton of black tin went to £113.17.0, and the quality showed an improvement—total, 242½ tons—realizing £27,608.

For the four weeks to October 20, Dolcoath crushed 7,876 tons and sold 130 tons of black tin which averaged £120.18.9 per ton. At East Pool, the water difficulty is reported as practically solved, so that the bottom can now be examined. It is generally thought that the prospect justifies the vigorous development of this part of the mine, as the lodes which gave such large profits in the upper levels are converging and should form a junction a few fathoms deeper. The broken pumping engine at Carn Brea has been repaired, but there does not appear as yet to be much improvement in the mine, although the working operations are now yielding a profit. Efforts are being made at Wheal Vor to commence drainage operations. The water in the mine is not very heavy, so that returns are hoped for early in the coming year. One of the next flotations, it is said, will be North and South Tolcarn, Camborne, as a united concern under the limited liability system. The transfer of the setts has been made, the vendors being W. J. Gilbert, James Rowe, Peter Temby, and W. H. Odgers, of Camborne. The property lies on the west of Grenville United and Great Condurrow mines, and contains eight proved tin and copper lodes. Capt. Gilbert thinks that the mine will be in full swing by the early part of 1907.

The high bank rate, while disconcerting to holders of gilt-edged securities and small speculators, has had little effect on certain specialties of the mining market. Among these, Siberian ventures have held their own, but it is recognized that these dealings are mainly of the 'shop' description, the interest of the public not being aroused even by sensational fluctuations, such as have occurred the last few days in New Vaal River diamonds or in a lesser degree by the upward movements in Cobalt Townsite, Broken Hill descriptions, and the Australian deep leads. The rise to £12 in New Vaal Rivers (£1 shares) is said to be due not merely to the discoveries at the mine, but also, if not mainly, to the squeezing of a ponderous 'bear.' On the other hand, "dear money" does not seem to have had an appreciable effect on the work of financial groups in opening up new fields of enterprise, and enlarging others already in operation. According to a telegram from Ekaterinburg, an English capitalist has acquired numerous gold mines in that district. The sum mentioned is 5,000,000 roubles. It is stated that 6,000,000 roubles will be spent in the development of the properties. The same capitalist, it is added, has also bought various properties and copper mines in Siberia and the Caucasus.

Coming nearer home, the directors of the Zinc Corporation have decided to recommend to the shareholders that the capital of the company be increased to £500,000 by the creation of 150,000 new shares ranking in all respects equally with the existing shares. Of these shares it is proposed to issue 113,333 at 25s., and to give all shareholders the right to subscribe in the ratio of one new share to three old ones. The board has arranged for a guarantee of the 113,333 shares at the issue price, without any consideration beyond the option to subscribe at £2 per share for the remaining shares, namely, 46,667. This guarantee has been given by Messrs. E. L. & C. Baillieu, of Melbourne, Messrs. Bewick, Moreing & Co., Messrs. Govett, Sons & Co., Messrs. Lionel Robinson, Clark & Co., and the London & Western Australian Exploration Co., Ltd. This issue will provide the company with £141,666 additional cash, and, if the option be exercised, with a further sum of £93,334, available for the following purposes: (1) To provide money for the exercise of further options over the tailing already accumulated and that to come from current operations of the mining companies under contract. (2) The expansion of the No. 2 plant on the British Broken Hill Proprietary to a capacity of 12,000 tons per month. It is anticipated that this plant will be in operation by the end of the year. (3) The completion of the No. 1 plant in course of construction at the company's site on the Broken Hill South Blocks mine, which is expected to be in operation by March, 1907, and of a capacity at first of 15,000 tons per month, but with the main portion of the structure providing for an expansion to 30,000 tons per month. (4) For the construction of a smelting works.

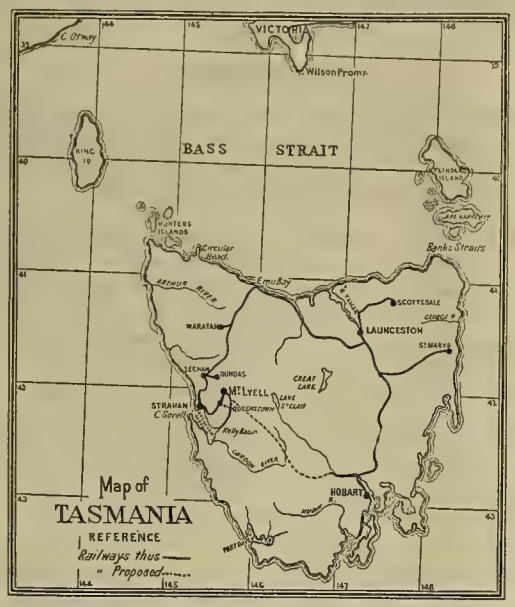
The quarterly report of Esperanza (Mexico) to the end of September shows an estimated profit for the period of $1,370,495 from 41,606 tons of dry ore crushed and 21,784 tons shipped to smelter. Mine development, 3,109 ft. According to extracts given from the manager's reports it appears that on the sixth level, south section, the north drift at raise No. 13 was advanced along the West vein 123 ft., showing a width of four feet of high-grade ore, and that the south drift at raise No. 13 West vein, was advanced 100 ft., also in high-grade ore. In the north section, on the seventh level cross-cut No. 24 west, north drift, east cross-cut is reported as having passed through a vein about six feet wide, composed of quartz and slate mixed. Assays obtained were high, averaging 1 oz. 15 dwt. gold per ton. At various other points in the mine the workings are described as being in "good" or "fair" milling ore. In spite of these satisfactory reports, huge monthly profits and the directors' denial of adverse rumors only a month ago, the price of the shares has been persistently lowered on the Stock Exchange. At the present figure (2⅜ to ½) it appears to have reached about a parity with the cash in hand added to the value of the ore actually blocked out. The weakening of Dolores on the market is explained by the forthcoming issue of 66,000 new shares at the price of $5. The very full and comprehensive report of Mr. John B. Farish on his first visit to the property in June and July, although in no sense disappointing, as to his opinion of the mine, seems rather to over-emphasize its isolated position and the difficulties of labor and transportation. These no doubt require special handling, but should not call for more than an ordinary measure of ingenuity, foresight, and resource on the part of the management. Mr. Farish recommends a further expenditure on Capital Account of about $80,000 "in order to make the population of Dolores comfortable and contented, to increase our milling capacity to a maximum of between 1,500 and 1,600 tons of ore per month, and to ensure prompt movement of freight between the railroad and the mine." Referring to the immediate outlook, Mr. Farish quotes from the manager, Mr. J. Gordon Hardy, who says: "The production, while not yet up to its maximum, should speedily get there and swell our present profits of $20,000 per month. Developments in the mine with depth, on our known orebody, are exceedingly encouraging, and are reaching the stage where it will be possible to place in sight additional reserves of magnitude." ——A smart piece of work has been accomplished at Camp Bird, in replacing the mill destroyed by fire after the

snowslide in March last. It is reported that 20 stamps were started on October 29 and that the full mill would be running November 1, that is to say, a month earlier than anticipated.

Melbourne, Australia.

The Zinc Corporation Affairs.—Economical Tin Mining in Tasmania.—Copper Mining in Queensland.—A Pamphlet on Cloncurry.—Newcastle Strike Ends.—Better Outlook at Broken Hill.

Affairs have undergone several changes in connection with the Zinc Corporation. The most important is the retirement of Herbert J. Daly from the position of managing director. The cause of this is not far to seek. Messrs. Bewick, Moreing & Co., and those associated with them in London, naturally, when they own the bulk of the shares in a company, like to dominate it. Therefore, despite the existence of a contract for the retention of the services of Mr. Daly by the company for a term of years, he has retired. Before this took place, however, a straight-out offer was made for Mr. Daly's interest in



the venture. He accepted the offer and then could not refuse the wish of the London holders to control the management. Later on, Mr. E. S. Simpson, who was brought over from Western Australia to direct operations for the company at Broken Hill, tendered his resignation, and Mr. Bradford, the chemist who was taken from the Broken Hill Proprietary Co. to supervise the treatment experiments, is resigning. The Broken Hill Co., once they heard of his resignation, snapped him up so as to secure the services of the man who knows as much about the treatment of the zinc-bearing ores of Broken Hill as anyone in Australia. Hr. Huntley, of the South Blocks mine, is to succeed Mr. Simpson. Mr. A. L. Queneau continues as consulting engineer. Mr. Queneau has been traveling between Broken Hill and the south coast of New South Wales to decide as to whether zinc smelters shall be erected by the Smelting Corporation at Kembla. So far, however, the public have not been let behind the scenes. This is a thing that Australians do not like, for one of the cardinal principles of their company laws is that the shareholder, as a partner, has a right of access to documents. Some day this point will be fought out in deadly earnest by an indignant shareholder who has suffered from lack of knowledge.

The Anchor tin mine in the Blue Tor, Tasmania, holds a record (in Australia, certainly), for cheap work. It treats a porphyritic rock carrying tin. The company is English, and its affairs were for a while administered by Mr. Lindesay Clark, who is now general manager of the Briseis tin mines, at Derby, also a big English concern. The present manager of the Anchor, Mr. J. B. Lewis, is a good successor to so able a man as Mr. Clark. The company has 100 stamps, and it has to treat ore carrying tin to the value of only 4s. 6d. per ton. Power is derived from Pelton wheels driven by water brought down from the adjoining ranges. Mining is all open-cast work, the ore being first treated in rock-breakers that deliver it automatically into trucks to be crushed at the battery, the tin oxide being subsequently saved on vanners and buddles. The working costs are only 2s. 6d. per ton and the receipts 3s. 6d. per ton, so that the best work has to be done to ensure profits. Last quarter the company treated 38,878 tons for 61¼ tons of tin oxide. The duty per stamp was about six tons. In addition, sluicing is done on a flat containing tin-bearing gravel, the returns being about 7d. per cu. yd., and the costs 3½d. This is about the average of the Briseis. With such poor ore as the company has to rely on, it is an everlasting tussle to keep on the right side of the ledger. But the task is achieved and the amount to credit is being quietly increased.

A very bitter pamphlet on the leading 'Copper Properties at Cloncurry, North Queensland,' by W. P. Rutherford, Jr., of the Tharsis Copper Co., and Mr. Kitchener, brother of Lord Kitchener, has been issued by the first-named. The district is receiving close attention just now because of the resurrection of a number of old mines under the shelter of the high copper market. The Cloncurry district has been dormant for many years, owing to the low price of the metal, the difficulty of access, the bad climate, and lastly the want of timber and water. The collapse of the Chillagoe boom has made the public very cautious about North Queensland, and this pamphlet will not help the market. Mr. Kitchener contends that the deposits of ore exist (1) as impregnations usually in the form of green carbonate, the copper having been laid down at the same time as the sandstones, and (upon their being tilted) having been leached out and redeposited along lines of stratification usually near beds of quartzite, or (2) as small lenticular deposits in the folds, or along the bedding planes of schist and shale. He says that all the rich ore has come from these pockets, and in no case has he seen "a true or fissure lode, and nowhere does the ore occur between well-defined walls." The sting of the pamphlet is that it is, in the main, the report that was sent to the Tharsis Co. (London) when in its search for a new property it had the Cloncurry district investigated by Mr. Rutherford. All the same, the reports to hand from the field respecting the Mt. Elliott mine, a claim in which a good deal of English money is being sunk, is satisfactory so far as work has gone. In that case the depth reached is only a little over 100 ft. The test will be when the water-level is reached. This has been the case with all the mines in the district, and it may be as well, therefore, that Mr. Rutherford has issued this note of warning.

The most pleasant piece of news in respect of mining is that all fear of a strike at Newcastle is at an end. This happy issue was the result of a prolonged conference between the miners and the employers. Both sides did the usual bluffing, but the fact that the owners were making such good profits and did not want to interfere with the splendid trade now being done in coal, was a factor in making them somewhat more plastic than usual. The fight over the retention of the 'dog' watch, or third shift, has resulted in the directors deciding to cease the practice. Everyone gave a sigh of relief when it became known that the parties had come to an agreement. The

selling price of coal will be raised to 10s. per ton on January 1 next, and the miners then will receive an increase of 4d. per ton on the hewing rate. At Broken Hill also the atmosphere was cleared, as the miners' request for an increase in wages, owing to the great profits being made by the company, is likely to receive favorable consideration. Mr. Delprat, speaking on behalf of the Mine Managers' Association, having declared that it was only fair that the workers should share in the prosperity of the company. A conference between the Miners' Union and the Managers' is to take place at an early date.

Johannesburg, Transvaal.

Diamond Flotations in South Africa.—Base-Metal Mining.—The Railroad Into Northern Rhodesia.—Scarcity of Capital for the Rand.—Complex Political Conditions.

Diamond flotations are very popular on the Rand at the present time. The number of syndicates that are being formed and the new companies floated prove how popular this form of gambling has become. Out of the long list one or two properties stand out as mines that will be successful. One new company had its first run the other day, and got a return of 0.666 carats per load. This is a good beginning. Most of the new diamond mines are in the Orange River colony, for the diamond law in that part of South Africa is far more favorable than in the Transvaal. If all these companies succeed in finding diamonds, one wonders what the effect on the market will be. So far the price has kept up remarkably well, in spite of the huge output of the Premier Diamond Co. Some people feared at one time that there might arise a serious competition between De Beers Consolidated and the great Transvaal producer, but so far the market has remained healthy. The diamond trade is watched by some of the cleverest men in the world, and there is no doubt that they will not allow the market to be swamped, no matter how many diamonds are turned out. To make diamonds as cheap as marbles would mean ruin to all concerned.

Tin and other base metals are in the background just now. Since the collapse of 'Sallies,' the public seem to be averse to base metals, especially tin. Great efforts are being made to get successful copper propositions in the Transvaal. Any number of prospects have been met, but so far the results appear disappointing. The prospects seem to be of the will-o'-the-wisp order. Beautiful samples are brought in, but upon investigation the mine is found to consist of a few specimens. Edendale Estates, a lead proposition, is opening up quite well, and it looks as if this would turn into a payable base-metal mine. On account of the hard times, it is impossible to do much with the mine at present. The owners are developing it slowly, and are waiting for better times.

An event of great interest to South Africa is advertised for next week, and that is the opening of the railroad from Victoria Falls to the Rhodesia Broken Hill mine, 400 miles north. This will be a great day for Central Africa. So far Rhodesia has been a country of bitter disappointments, but it is stated that when the Broken Hill mine commences sending lead and zinc ore to Europe, people will realize the immense possibilities of this region as a base-metal producer. There is a scheme on foot to amalgamate northeastern and northwestern Rhodesia into one government, and to move the capital from Kalomo to the environs of Rhodesia Broken Hill. The immediate neighborhood of the mine is flat, rather unhealthy country, but six or seven miles away there are some high hills, which would prove an excellent site for the new capital. Thus by mining is civilization being carried into the very heart of the Dark Continent.

The Transvaal is beginning to feel the scarcity of capital. It would be almost impossible to float a 'deep level' at the present time. Several deep-level mines have ceased operations and will wait for better times. A number of shafts are being pushed ahead on the central Rand, the most important of which is the huge seven-compartment shaft of the Turf mines, which does not expect to strike the reef at much less than 4,000 ft. Only one shaft is being sunk on this property, as it is expected to connect with mines to the north for ventilation.

Politics are playing the most important part in the Transvaal at the present time. New parties seem to be born every day. The British population seems to be more disunited than ever. The Boers have only one party, 'Het Volk.' They are not saying much, 'just sawing wood.' The uncertainty of the future is positively disconcerting. All sensible people realize how easily the noble fabric of the mining industry can be disabled or wrecked. At present there is much distress. If you are an American citizen you get many requests for assistance from people hailing from the same country.

Butte, Montana.

The Boston & Montana Sinking on the Badger State.—Resumption of Work on Several Large Mines.—Great Activity in Developing the District.—The Goldsmith Co.—East Butte Explorations.—Butte & London.—The Amazon-Butte Erects a New Plant.

The Boston & Montana Co. has begun sinking a shaft on the Badger State claim, situated east of the North Butte mine, and will probably sink to a depth of 1,500 ft. The rich vein of the Jessie, owned by the North Butte, is known to strike through the Badger State, and when opened that property is expected to prove one of the most valuable in the possession of the Boston & Montana. The company will be able to work not only the Badger State through the new shaft but also the Auraria and Moose and several other claims in that neighborhood. The Boston & Montana ground is practically in the centre of the North Butte section.

All of the large copper mines of the Butte district are again in operation, the last one to resume is the Never Sweat of the Anaconda. The latter was closed for several weeks on account of the shifting ground under the hoisting engine. It has been repaired and the engine is again running smoothly, but it is the opinion among mining men that it will be but a question of time until the engine will have to be moved to firmer ground. The closing of the Never Sweat shaft did not make much difference in the output of the Anaconda mines, for the property was mined just the same and the ore hoisted through adjoining mines. The Colusa, of the Boston & Montana, has also resumed work and now all the mines of the Amalgamated are producing again, the total output of the Amalgamated properties now being about 10,000 tons per day. The total daily output for the district is in excess of 13,000 tons.——A great amount of development work is going on in this district, and a large amount of new territory will be open for mining during 1907. Sinking is being done on the Parrot, Pennsylvania, West Colusa, Cora, North Butte, Badger State, Granite Mountain, Leonard, Blackrock, Elm Orlu, Colusa-Leonard, on three claims of the Butte & Bacorn, on the Trifle of the Butte Copper Co., Ida-Montana, East Butte, East Butte Extension, Ophir, South Butte, Farrell & Alliance, Greenleaf, Pittsburgh & Montana, Davis-Daly on four shafts, the Tuolumne, Anaconda, and on a number of other properties. The Davis-Daly Estates has purchased another 30-ft. frontage on Broadway adjoining the

Smokehouse shaft, corner Broadway and Wyoming streets, for mining purposes, in the very centre of the business district.

The recently organized Goldsmith Mining Co. is working 50 men and hoisting about 150 tons of ore daily; this is shipped to the smelter at East Helena. The lowest net returns from the smelter on recent shipments were $12 per ton. The ore runs high in silver and also carries gold and copper; the lowest copper assay recently was 3½%. On the 400-ft. level the vein has an average width of three feet, with stopes 100 ft. high. At the west end of the Goldsmith there is a quantity of ore in sight that assays 160 oz. silver, $18 in gold, and one per cent copper. The great Rainbow lode, in the northern part of the Butte district, strikes through the Goldsmith properties. It is the opinion of mining men that at greater depth than is now opened, the Rainbow lode will be found rich in copper.

The shaft of the East Butte Mining Co. has reached a depth of 600 ft., where a station is being cut. When it is finished, sinking will be resumed and continued to 1,000 ft. Work continues in the north and south cross-cuts from the 400-ft. station, but no other cross-cutting will be



Montana.

done until the big shaft being sunk at the southern extremity of the company's ground is deep enough for connections with the main shaft at 400 ft., so that the mine can be ventilated. The north cross-cut has opened the vein of the Simons mine at the 400. The vein contains 2½ ft. of copper glance, and is the same orebody that is being mined on the upper levels by lessees. The iron cap on the Glengarry vein, one of 21 veins that cross the East Butte Co.'s ground, is absent from all the other veins that have been mined. On the Glengarry the iron is encountered at a depth of 160 ft. and continues for 150 ft. deeper. The Hancock shaft of the East Butte is now in the iron zone. The J. I. C. shaft of the Anaconda Co. is also on the Glengarry vein, and although mining is being done to a depth of 400 ft. the iron has not yet been encountered, showing that the iron zone dips deeper into the earth as it goes westward. The iron cap is found in many mines of the Butte district and at varying depths.

The shaft of the Butte & London has reached a depth of 725 ft., but there is little change in the character of the ground. The 12-ft. vein that was cut two weeks ago has passed out of the shaft to the south; when a depth of 800 ft. is reached a station will be cut and a pump installed, after which sinking will be resumed and the shaft carried to a depth of 1,200 or 1,500 ft. It is not likely that any cross-cutting will be done short of the 1,200-ft. level.

The Amazon-Butte Copper Co., recently organized in Butte, is erecting a hoisting plant and will soon be equipped to begin sinking and development. The company owns the Amazon, West Altona, and Gaynor claims, southeast of the old district of Butte, and at the junction of the Bullwhacker and Ida-Montana veins. The Bullwhacker vein strikes north and south and that of the Ida-Montana Co. east and west, and whatever there is in the Bullwhacker and Ida veins is expected to be found in the Amazon-Butte ground. All the machinery has been delivered and ground has been broken for a three-compartment shaft at a point of intersection of the east and north veins. John Hewett, formerly superintendent of the Gagnon mine of the Trenton Co., has taken charge for the Amazon-Butte. The company is well financed and the work of development will be prosecuted rapidly. A number of new companies are now operating on the east side. Among them are the Butte Copper & Exploration, Butte & London, Amazon-Butte, Boston & Montana, Bullwhacker, Ida-Montana, Lewisohn General Development, Pittsburgh & Montana, Colusa-Leonard Extension, and Calumet & Butte.

Toronto, Canada.

Transfer of Mines at Cobalt.—The Glendinning is Sold.—La Rose Prospecting With Diamond Drill.—Promising Developments.—Good News from Kerr Lake and the Nipissing.—Mining Under the Lake.—Larder Lake District.—Silver Discoveries in Temagami Region.

The principal feature in the Cobalt mining situation continues to be the heavy investments made by American capitalists in mines of established reputation, and the acquiring of controlling interests in prominent Cobalt companies by new organizations. The most important transaction of the week was the sale of a nine-tenths interest in the University of Glendinning mine to a syndicate composed of John McMartin, Duncan McMartin, David A. Dunlop, Henry Timmins, and Noah Timmins, all largely interested in other Cobalt mines. The price is understood to be about a million dollars. The property comprises 50 acres on the shore of Giroux lake and the ore in the veins so far developed is holding out at a depth of 300 ft. Machinery is being installed to develop other veins showing on the surface. The stock will shortly be placed on the market.——A controlling interest in the stock of the Gilpin Cobalt Silver Mining Co. has been bought by H. Dreany, of Toronto, on behalf of a New York and Boston syndicate; the price being upward of $400,000. The property is in Bucke township 2½ miles west of Haileybury. Willis Abbott, of New York, has purchased for $320,000 40 acres of mining land from the Gordon Cobalt Silver Mining Co., situated about one mile from Cobalt town. It has not yet become a shipping property, as the ore is comparatively low grade, assaying 70 to 120 oz. per ton. The Violet mine, a shipping property near Cross lake, has been bought by Clarence J. McCuaig, of Montreal. Numerous other deals of undeveloped properties are reported.

The Ontario Government has begun the publication of monthly official reports showing the shipments of Cobalt ore over the Temiskaming & Northern Ontario Railway. The shipments for the month of October amounted to 1,120 tons, the Nipissing mine heading the list.

At La Rose mine, the diamond-drill has been sent down over 200 ft. below the bottom of the 300-ft. shaft. It was in high-grade ore all the distance, the lowest point showing ore equal to that found in the surface workings. Development work is being actively pushed at the Kerr Lake, or Jacobs, mine at a depth of 130 ft. below adit-level on the main vein. The cross-cut shows high-grade ore and a banded fissure with several other

calcite streaks in addition to the 4-in. vein of high-grade ore. At the Nipissing the fault at the bottom of the south drift of vein No. 26 has been found several feet to the east, where there is a showing of 12 in. of ore, considerably richer in silver than the upper part of the vein. The shaft is going down and a station will be cut for driving both ways on the vein. Vein No. 27 broadens out at the 35-ft. level to nine inches and shows rich free-silver contents. The operating force, numbering 200, is being steadily increased. The Coleman Development Co., operating about five miles southeast of Cobalt town, has opened up a promising vein of cobalt with a fair showing of leaf silver. The Columbus is developing a vein of cobaltite, but the silver content is low. At the Big Pete location, near the Foster, a calcite vein has been struck at the 30-ft. level, which it is thought may prove to be a continuation of one of the Foster veins. The Silver Queen has opened up a new 12-in. vein which shows some native silver and promises well. At the 75-ft. level on the main shaft about 100 ft. of driving has been done. The vein of high-grade ore shows a steady width of 16 to 18 in. and the wall-rock is highly mineralized.

The Ontario Government on the 7th inst. heard applications on behalf of the representatives of the Bessey claim and the Green-Gordon claim, to be allowed to mine under the waters of Cobalt lake from shafts sunk on the shore. Premier Whitney's attitude was strongly against the applications, but the decision of the cabinet was reserved.——G. T. Smith, mining recorder at Haileybury, Ont., states that upward of 350 claims have been so far located in the Larder Lake goldfield. None of them have so far been inspected, and as the district is now practically inaccessible, owing to the setting in of winter, the inspections necessary to confirm the titles of the locators cannot possibly be made before spring. Nevertheless the formation of stock companies based on these discoveries will go merrily forward for the benefit of the small investor, who seems ready to snap at anything in the shape of a mining proposition.

Rich silver finds have been made in the southwest corner of Auld township in the Temagami forest reserve. Twelve claims have already been staked. White Brothers, of Muskoka, have taken up a location containing large quantities of native silver, specimens of which have been brought down. F. N. McConnell, of Haileybury, has also made a good find. The ore is said to be similar to that of the Cobalt area. The new field is reached from a point on the Montreal river about 20 miles from Latchford and thence by an overland journey of 15 miles. Owing to this area being within the boundaries of the forest reserves, prospecting is subject to special regulations for the protection of the timber, and great care is taken in the issuing of permits. All claims must be opened up under the supervision of the superintendent of the reserve.

Einar Lindeman, who was commissioned by the Canadian Superintendent of Mines to report on iron deposits near Bathurst, N. B., reports that he has discovered another deposit of much greater extent than those known to exist. It is 75 ft. high, 80 to 100 ft. wide, and extends down for 1,800 ft. to the Nipissing river, which it appears to cross. The discovery is an illustration of the method of examining magnetic iron ore deposits, originated by Dr. Eugene Haanel by the use of magnetometric measurements.

D. D. Cairnes, of the Dominion Geological Survey, who has been engaged during the summer in surveys in southern Yukon, forwards to the Department some important details as to copper discoveries in that district. He writes that west of Whitehorse there are all the makings of a wonderful copper country. One of the most recent and valuable discoveries has been made by Byron N. White, of Spokane, on the Pueblo. With a small crew, principally doing surface work, he has uncovered an orebody about 250 by 270 ft., and has sunk about 100 ft., but as yet he has found neither wall. The ore is almost solid hematite, heavily impregnated with copper minerals, and will average 4% copper, with some gold. Throughout there are masses and streaks of high-grade ore. Mr. White is shipping 100 tons, and buyers are negotiating for large consignments.

Calumet, Michigan.

Big Production.— Scarcity of Labor.— Operations at the Quincy.— Copper Range Consolidated Increases Output.— Changes at the Ahmeek.— Ontonagon County Mines Doing Well.— Unusual Activity in the Building Trade.

Lake Superior mines produced 20,000,000 lb. refined copper last month, more than was turned out in any previous month in the history of the district. On the basis of 22 cents per pound, which was the average price of Lake brands, the October production was worth $4,400,000. Notwithstanding the enormous consumptive demand for the red metal and the wish of the mining companies to sell as much copper at the high price as they possibly can, the increase in the total production of the Lake Superior region for 1906 will be slight. Labor strikes, accidents, fires, scarcity of labor, etc., have combined to restrain operations, and some of the important mines will show an actual decrease in their yield for the year. The unprecedented activity in nearly all kinds of metal mining has resulted in a dearth of miners and trammers, not only in the Michigan copper mines, but in the iron districts, and in many other mining regions.

The record-breaking output last month was due primarily to notable increases at the Quincy, Baltic, Trimountain, and Champion mines. The Allouez, Centennial, and Tamarack mines also enlarged their production. Last month's output of the Quincy was, with one exception, the largest in its history. Shipments to the stamp-mill are now at the rate of 3,900 tons daily, larger than ever before, and November should witness a further gain. The new No. 8 shaft on the Mesnard branch of the mine is yielding excellent ore from its lower levels. This portion of the mine adjoins the lands that it is proposed to buy from the Arcadian company. The Mesnard's bottom openings are in good ore. As the Hancock Consolidated cuts off the possibility of the Quincy expanding in a southwesterly direction, its only possible chance to enlarge its property is by buying the Arcadian lands. No. 7 shaft, the Quincy's most southerly opening, continues to yield a large tonnage, but this important opening cannot be sunk to much greater depth, because it has nearly reached the boundary line of the Hancock Consolidated. The No. 6 shaft has lately been yielding mass and barrel copper, which in earlier years formed such a large portion of the production.

All three Copper Range Consolidated mines showed good gains last month. The Champion leads the trio in the amount of its output, but the Trimountain showed the greatest gain. The combined production of the three mines was 3,760,000 lb. refined copper, which is at the rate of 45,000,000 lb. per annum. As the St. Mary's Mineral Land Co. has a one-half ownership in the Champion, this would make the annual production of the Copper Range Consolidated 34,640,000 lb., and that of the St. Mary's Mineral Land 9,360,000 pounds.

At the Ahmeek, production was curtailed by changes in the system of operating the mine, but all the new equipment is now in use and ore shipments will be larger henceforth. Both No. 1 and 2 shafts are working under the new system, but until an additional

compressor is provided it will be impossible for the mine to yield more than 1,100 tons of ore daily. The ore is shipped to the Tamarack mill, where the facilities for stamping it are adequate, as the Tamarack is still hampered by the fire in No. 1 shaft.

The Michigan mine is making steady recovery from the effects of the recent labor troubles. The men who participated in the riot were discharged, and owing to the scarcity of men it has been slow work getting the working force back on a normal basis. Because of the lack of men, surface improvements are slight and a number of drills underground are now idle. Despite these unfavorable conditions, the Michigan is maintaining shipments at the rate of 550 tons per day and as soon as possible they will be increased to 700 tons, which is nearly the maximum capacity of the two heads, which it has under lease at the Atlantic mill. Other Ontonagon county mines besides the Michigan are working short-handed. The Adventure is in urgent need of 25 trammers and laborers. The electric tram line in No. 3 shaft has been completed. This will be a great help in moving the ore and in overcoming the lack of labor. The Mass Consolidated also is crippled by lack of trammers; if men were available the Mass could increase its shipments at least 300 tons per day. The new *D* shaft was sunk 80 ft. last month with only one drill and a crew of four men, an exceptionally good record. This shaft is penetrating the same kind of ground that was opened in the *C* shaft at the same depth, which is very encouraging. The shaft is being enclosed and every provision made for the protection of the men before inclement weather sets in. *C* shaft is shipping a good tonnage of rock of a satisfactory grade, and the surface plant, which embraces some new and economical features, is giving good service.

There is extraordinary activity in the building trade of the copper country because of the prosperous condition of the mining industry. At the North Kearsarge mine the Osceola Consolidated Copper Co. has had 20 new dwellings erected, and 20 houses have been built at the Ahmeek. These are all single houses, with four to seven rooms each, and designed to meet the needs of the increased working forces at those mines. At the Caldwell property, south of the Tecumseh, the Calumet & Hecla is having two residences erected and a boarding house to accommodate 40 men is going up; and at its Gratiot mine, north of the Mohawk, the same company is making similar improvements. The building operations at the Caldwell and Gratiot properties are significant, for they indicate that the Calumet & Hecla plans to work them on a large scale.

Cripple Creek, Colorado.

Litigation Among Lessees.—The Granite Company Ceases Pumping.—Rich Ore in the Bonanza King.—Stratton's Independence Ships High-Grade Stuff.—More Cyanide Plants.—The Vindicator Makes Interesting Improvements.

The production of the Old Gold mine on Beacon hill, under lease to George Simonton and partners, has decreased during the last month to one-half of its original amount. This is owing to the decision of the District Court, which refused the lessees permission to work the Indicator fraction, at present in controversy between the Henry Adney mine adjoining and the Old Gold. Four cars were shipped during October from this lease which ran 1½ oz. per ton.——A car of $20 ore per week is being shipped from the Lady Stith claim of the Stratton Estate on Globe hill. James Clifford and associates are subleasing this ground from Keener & Hobson, and are working on a surface cut as well as on the 500-ft. level. ——Operations have been resumed at the Jo Dandy mine on Raven hill after a shut-down of two months. The Jo Dandy Co. has been re-organized with James M. Wright as president and general manager. The Gillett mill of the Cripple Creek Cyanide Co. is being torn down and will be erected on the Jo Dandy ground for the treatment of the lower grade ore. The capacity will be in the neighborhood of 150 tons per day. When the mine is in full running order again it is expected that 30 cars per month of ore, averaging a little over $20 per ton, will be shipped.

The Granite Gold Mining Co. has suspended pumping operations on the 1,000-ft. level of the Gold Coin shaft. The drowning of the pumps of the Strong mine some months ago left the Granite as the only mine on Battle mountain which was pumping water and, being at the lower level, this pumping has been found to be more beneficial to the surrounding properties than to the Granite itself. The ore below the 1,000-ft. level was not of sufficient grade to warrant the expense of keeping the workings clear of water. It is hoped that in the near future some arrangement will be arrived at whereby all the principal mines on Battle mountain will combine and sustain their various proportions of the expenses of pumping conducted at one of the properties.

A rich streak of high-grade ore has recently been encountered in the Bonanza King claim on Gold hill. Lipscomb & Co. is operating this ground through the Gold hill tunnel. When broken two feet wide the ore ships about 5 oz. per ton. The strike is considered one of the most promising in the camp. —— The Mary Casheen mine, situated in the town of Victor, is making regular shipments of fair-grade ore. Harry White, brother of E. Lyman White, State Commissioner of Mines, is operating this property, the principal work being done on the 600-ft. level not far from the shaft. About five cars are shipped every month, the ore being mined 2½ ft. wide and running several ounces in gold.—— A new ore-house has been erected on the Ocean Wave claim on Battle mountain, under lease to John Nichols, and shipments will commence shortly. Work is being done at a depth of 300 ft. on a body of ore three feet wide, assays running between $20 and $60. —— A 21-ton car of ore, giving returns of over 7½ oz., has been shipped during the last week by Stratton's Independence, Ltd. It was obtained from the Washington claim south of the Independence No. 1 shaft in the granite area; this shows that the mine is still far from being worked out.

Sixty tons of ore per day are being treated by the Pony Gulch cyanide mill, which has lately commenced operations. A good deal of experimental work is being done on low-grade ores and an extraction of 98% is said to be made at the present time.

Ore is being extracted from the Los Angeles mine just north of the Last Dollar property, on the south slope of Bull hill. Otto Taubert and John Hodges, who have done so well on the Little Clara mine of the Work company, have this mine under lease. Operations are being conducted on the 300 and 400-ft. levels, where two machines are at work on a fair-sized orebody. A shipment will be made within the next few days.——The Vindicator Consolidated Gold Mining Co. on Bull hill is installing a belt-conveyor in the ore-house. It is to be used for sorting purposes. The conversion of the old Lillie shaft, belonging to the above company, into a gold extraction mill is progressing favorably. The main process will be cyanidation, but an Edwards roaster will be installed, so that sulphide ores may be treated. This roaster is an Australian production, having been invented by Thomas Edwards, of Ballarat. The mill will have a capacity of 150 tons per day. H. A. Shipman is superintending the work on this new plant.

Salt Lake, Utah.

Local Business.—News From Park City.—Strike in the Odin.—Operations on Scott Hill.—Ontario Adit Not Yet Repaired.—The Carisa Finds New Orebody.—The Coal-land Cases.

The ore and bullion settlements reported last week amounted to $924,700. During the same period 291,580 shares were sold on the floor of the Salt Lake Stock & Mining Exchange for $279,499.

The ore production of Park City mines last week amounted to 1,830 tons, the contributing mines and amounts being: Daly-Judge, 536; Silver King, 534; Daly-West, 500; Little Bell, 68; Ontario, 66; Kearns-Keith, 56; New York, 57.——Late developments at the Odin mine, near Park City, are of an important character. A drift on the Odin vein has been run for 199 ft. disclosing a breast of ore averaging 19.8% copper, 11% lead and 16 oz. silver. W. I. Snyder, of Salt Lake, is manager.——The directors of the Silver Bell Mining Co. have levied an assessment of 25 cents per share on the issued stock for development purposes.——Much interest is being taken in that part of the Park City district known as Scott hill, situated between the Uintah and Big Cottonwood districts. Important developments have been made lately in the Scottish Chief mine and bond and lease have been obtained by Park City parties on the Brown group, which will form the basis for the organization of the Copper Apex Mining Co. Permanent buildings are under construction and preparations are being made for a vigorous campaign. The lessees are David Scott, A. Pike, and Lee Wight.——The new hoisting plant at the Magnolia St. Louis mine has been placed in position. This company is sinking a shaft.

The stock of the Daly-Judge Mining Co. is to be listed on the Boston Stock Exchange. An examination of the mine is now being made by an engineer, whose report will accompany the application. —— The management of the Ontario drainage adit, at Park City, has concluded that it is necessary to run the parallel drift ahead for possibly 150 ft. further to reach the end of the caved section, which means that it will be several months yet before the mine operators can reasonably hope to see the last obstruction removed.

The management of the Carisa Gold & Copper Co. reports the strike of an entirely new orebody on the 300-ft. level; on the strength of this the stock has advanced sharply.——The Victor Consolidated management is preparing to sink the main shaft 300 ft. deeper, and to prepare the property for ore extraction. —— The directors of the Beck Tunnel Consolidated and Carisa Gold & Copper companies have posted dividends for payment this month, the former for $40,000, and the latter for $5,000. —— At a special meeting of the shareholders of the Lower Mammoth Mining Co. the question of increasing the capital stock of the company from 150,000 to 300,000 shares came up for consideration, resulting in the defeat of the amendment.

The Talisman Mining Co. has filed articles of incorporation to operate in Beaver county. P. B. McKeon is president; James Ingebretzen, vice-president; J. W. Stringfellow, secretary and treasurer; who, with P. J. Donahue and Frank Knox, are directors. Salt Lake City is the headquarters of the company.

The arguments in the coal-land cases brought in the Federal Court in this city against the Pleasant Valley Coal and Utah Fuel companies by the United States Government have been concluded, and Judge John A. Marshall, before whom they were tried, has them under advisement. These are the cases in which the Government claimed that the defendants had obtained title to coal-lands through fraud and in addition to having the patents to the same voided, seeks to recover the value of the coal mined therefrom.

Mining Summary.

ALASKA.

The first regular shipment of ore from the Cymru mine to the Alaska Copper Co.'s smelter, under a recent contract, netted 662 tons, containing after all deductions, 49,319 lb. copper, and the valuation based on present prices is $9,370, equivalent to $14 per ton net.——The Cuprite Copper Co., operating on the west coast of Prince of Wales Island, is reported to be making an excellent showing. An outcropping of four feet of ore on the surface at an elevation of 2,200 ft. showed a valuation of $38 per ton.

The strike on Chichagoff island, 40 miles from Sitka, has created excitement. The De Groff claim is the richest of the Chichagoff propositions. Assays run high. One specimen was composed almost wholly of sylvanite. The new camp is expected to help Sitka, that place being the distributing point for supplies.

C. A. Tellier and Lawrence White, members of the Brunner railroad engineering party that has been doing some extensive work in the Catalla district of Alaska, were both drowned while attempting to cross Bering lake in a severe gale. The news was recently brought to Seattle by George Evans.

ARIZONA.

COCHISE COUNTY.

A new strike of sulphide ore has been made on the 13th level of the Old Dominion mine in the Globe district. The ore assaying from 8 to 20% copper will go direct to the furnaces. —— A hoisting plant is to be installed in the Chronicle mine on Lower Lynx creek, and the sinking of the shaft to the 500-ft. level resumed. Two hundred and fifty feet of driving and cross-cutting have already been done from the 85-ft. level. —— The daily receipts of the Arizona Smelting Co., at Humboldt, average between 450 and 500 tons; the capacity of the plant is being increased as fast as machinery can be delivered. With the installation of new furnaces, receipts are expected to reach the 1,000-ton mark before the first of the year.

MOHAVE COUNTY.

A party of Eastern capitalists have taken over the mines of J. F. Tomlinson and others situated in the Wright Creek district and are having surveys of the mines made and a town plotted.——The Gold Road Mining & Exploration Co. has declared its third dividend of 25c. per share, amounting to $75,000.

PINAL COUNTY.

(Special Correspondence).—A great deal of work is being done at the Ash Creek Co.'s mines at Safford. Some months ago a large body of high-grade copper ore was discovered in the Shamrock claim, and it was decided to ship the ore to Clifton for treatment. About 15 tons per day is being sent to the Shannon Copper Co.'s smelter. The entire work is not confined to taking out shipping ore, but a good force of men is kept busy developing other claims in the group. For a number of years Tom Larkins has been in charge of these mines. He has gone through all the discouraging processes that so often swamp young companies in a new and undeveloped region, and he has made a success. The entire district is developing satisfactorily. After starting the concentrator at the San Juan mine a short time ago, Mr. A. Weber soon discovered that he did not have sufficient water. At first the old San Juan shaft, which had nearly 100 ft. of water in it, yielded a supply, but it did not take many days to exhaust that. Then the old Greenough shaft was cleaned out and pumps put to work, and this proved to be sufficient. Then Mr. Weber has a force of men sinking a well at Walnut Springs. Here they have developed what is believed to be sufficient water for all purposes. Early this week a carload of pipe arrived in Safford and was immediately sent to the mines, and is now being laid to conduct the water from the spring to the mill. The water has to be piped about a mile and a half. When they get the connections all made the concentrator will be kept in constant operation.

Phœnix, Nov. 12.

YAVAPAI COUNTY.

An important strike has been made on the summit of Thumb Butte and Copper Basin divide by S. H. Anderson in his new shaft, who, at a depth of 17 ft., uncovered a pay-streak over four feet wide, six inches of which assays over 100 oz. silver per ton, the remainder being second-class ore. These four claims are situated six and one-half miles west of Prescott.

CALIFORNIA

CALAVERAS COUNTY.

An attachment has been levied against the Ohio mine by an employee of Ballentine, who had a bond on the property. The question at issue will be a test of the prevention of laborers from levying upon mines on which have been posted notices that the owners will not be responsible for the debts of those to whom the mine has been bonded.

INYO COUNTY.

Ali H. Hassan has resumed operations at the Bishop Creek gold mines. A new cross-cut adit 700 ft. long is being driven to cut the lode and determine the full width of the ore. Pelton wheels, pipes, compressors, drills, and a Nissen stamp-mill have been ordered. The camp is at an altitude of 6,000 ft. in the Sierras.

NEVADA COUNTY.

A promising mine is being developed in the Chicago Park district, where a five-stamp mill has been recently built to handle ore of good grade from the Ozalli and Shebley property.——New pumps have been installed and are now in working order at the flooded Canada Hill mine. The water has been lowered to the 800-ft. level. The shaft is 1,300 ft. deep, and the work of clearing it will be pushed with vigor, after which sinking and driving will be commenced.

SISKIYOU COUNTY.

U. S. Mineral Surveyor Fitzpatrick, of Oakland, has a surveying party out on Siskiyou mountains, near the Oregon line, fixing boundaries on several claims for the Blue Ledge Co. Snow has already begun to fall at the 7,000-ft. elevation.——Work has been resumed at the McKinley quartz mine on Humbug, the shafts and drifts having been pumped out. Quartz is being taken out under the superintendence of A. L. Hayes.——A large compressor is being installed by A. C. Brokaw & Co. at the Golden Eagle mine on Indian creek. The mill is running continuously on high-grade ore from which $3,000 to $5,000 in bullion is extracted monthly.

TUOLUMNE COUNTY.

(Special Correspondence).—The company operating the Clio mine, near Jacksonville, intends to erect a 200-stamp mill on the property in the near future. Much work is to be done besides this. The one-compartment shaft, now 400 ft. deep, is to be enlarged to two compartments and sunk to a depth of 1,000 ft. An adit intersects the shaft 200 ft. below the surface, and from this point up the shaft will be enlarged by stoping. The company also proposes to install an electric plant on the Tuolumne river which will generate sufficient power to run the mill, hoist, compressors, and any other machinery.——The Bagdad-Chase Gold Mining Co. recently made a mill-test on ore from the Soulsby mine and the result is said to have been most satisfactory. The Pennsylvania shaft on this property has reached a depth of 700 ft., and at the Davidson shaft the water has been lowered to the fifth level. A steam-pump has just been installed in the mine to raise the water to this level, from which point it is then taken by a pump on the surface. A large compressor is being installed at the Pennsylvania shaft. The ditch which supplies water to the Soulsby is being repaired and steam is being used temporarily for power.——A small crew of men is engaged in doing development work at the Sullivan mine near Soulsbyville, and the prospects are said to be exceedingly encouraging.

Good reports still come from the Yorktown mine, situated on the Ida Klein ranch, near Stent, in which a rich strike was made several weeks ago. The perpendicular shaft is now 60 ft. deep, from the bottom of which a cross-cut has been driven and the vein tapped. Coarse free gold is scattered thickly in the quartz and the vein is rich almost its entire width. When the strike was made several weeks ago it was believed by some that it was a pocket, so rich was the stuff, but more recent development proves that this is not the case. Mining men who have examined the property agree that it is one of the most promising new mines in the State today. The owners, Messrs. Lyon, Baum, & McFarland, have equipped the property with a hoisting and pumping plant and will continue development work vigorously.——A hoist to be operated by water-power is being installed in the drainage adit of the Patterson mine. When this work has been completed a winze will be sunk. A Dimmick pulp-sizer and pin-blanket tables are also being installed. Supt. Davies states that grading for the 20-stamp mill is almost completed.——It is reported that operations will shortly be resumed at the Mazeppa, situated south of Stent.

Tuolumne, Nov. 13.

(Special Correspondence).—There is promise of great activity at the Confidence mine in the near future. W. P. Cunningham, of Los Angeles, and others have obtained possession of the property and propose working the mine in a more systematic manner than ever, as well as on a much larger scale than in the past. Work was commenced last week, when a new three-compartment shaft was started at a point 1,200 ft. north of the old one-compartment shaft. It will be sunk to a depth of 1,000 ft., and drifts will be run to tap the old workings and to open up new orebodies. Twenty stamps will be added to the mill, making in all 40 stamps. It is estimated that not less than 100 men will be employed when development work is well under way. W. H. Scott is superintendent. The Confidence has not been worked to a great depth as yet, though it has produced nearly $6,000,000.——Though it was expected that by this time the water supply for the mines of Tuolumne county would be exhausted, and as a consequence there would be no electric power, both of these are yet available and the prospects are that there will be no interruption of operations on this account this season.——The Pyrenees Gold Mining Co. has let a contract to Gribble Bros. & Muldock, of Tuttletown, to drive a 100-ft. cross-cut adit at the Patterson mine. The object of this work is to tap the Arbona vein, which the company believes passes through its property.——Owing to delay in the arrival of new machinery, several men were temporarily laid off at the Columbia mine last week.——Eastern capitalists have had an expert at the Ohio mine the past few days, making a thorough inspection of the property with a view to purchasing it.——It is reported that several capitalists, with Geo. Ade at the head, are making preparations to begin operations at the Moody.

Tuolumne, Nov. 12.

Work has been commenced on the Confidence mine with W. P. Cunningham as superintendent. A three-compartment shaft will be sunk to a depth of 1,000 ft., the point of development being 1,200 ft. north from the old shaft. Twenty stamps will be added to the mill, which will operate day and night.

COLORADO.

EL PASO COUNTY.

(Special Correspondence).—Work is progressing as rapidly as possible on the new mill of the Golden Cycle Co., which is being built on the site of the old Telluride mill near Colorado City. Not much of the machinery of the old company is being used. Several new Edwards furnaces are being installed by Chisholm, Matthew & Co., of Colorado Springs. It has taken longer to erect this plant than was anticipated on account of the slow delivery of material for the building. The 182-ft. concrete stack has been completed by the Weber Steel Concrete Co., of Chicago, and the flues are now being built. It is estimated that the mill will have a capacity of 700 or 800 tons per day; it will probably be ready for treating ore in January. Philip Argall, of Denver, is the chief engineer, and Harry E. Nelson his assistant. John Tait Milliken will have charge of the plant when finished.

Colorado Springs, Nov. 10.

GILPIN COUNTY.

A decision has been rendered by the U. S. Circuit Court of Appeals at St. Louis, Mo., in the Topeka mine case, giving judgment for the defendant, Henry P. Lowe, in the sum of $182,500 and interest for five years. Attorneys for plaintiff

have petitioned for a re-hearing, which will probably further delay operations at this property.——A deal has been closed whereby Chicago people have become owners of the Senator and Senator Extension mines, situated in Gregory district. Consideration not stated.——The School Hill Mining Co., which has a lease and option on the Cœur d'Alene and Isabel mines, located on Academy hill, Eureka district, is making plans for carrying on heavy operations. Owing to years of idleness, it is necessary to re-timber the main shaft on the Cœur d'Alene from top to bottom. A new hoisting engine and a five-drill air-compressor are to be installed. As soon as the 600-ft. shaft can be unwatered and re-timbered, Superintendent Mackay intends to clean out the various levels, extend them, and sink the shaft considerably deeper. ——As fast as the workings of the Saratoga shaft can be relieved of water, men are put to work to clean the levels for regular operations. Lessees are working in the shallow levels and are taking out ore which runs between 8 and 11 oz. gold per ton, besides silver values.——The work of cleaning out the Old Town mine has been completed, and the contractors have commenced sinking their 1,500-ft. shaft. George J. Kimball, Jr., of Idaho Springs, is manager, and James Redding, superintendent.

IDAHO.

Development on the Idora mine is progressing and a cross-cut is being driven to determine the width of the orebody. A winze is to be sunk from the face of the tunnel, and stoping begun at the 225-ft. level. Tunnel No. 3 is at a vertical depth of 400 ft. A five-drill compressor will be installed as soon as possible.——A vein of galena has been struck on the Independence claim on the Snowstorm vein, adjoining the Lucky Calumet on the west, in a cross-cut at 3,000 ft.——An important find has been made at the Stewart mine controlled by A. F. Heinze, consisting of 30 ft. of solid galena, in a cross-cut. The limit of the adjoining concentrating ore has not yet been reached.

SHOSHONE COUNTY.

A sensational strike is reported in the Wonderful group on Stevens Peak. An orebody 18 in. wide, of chalcopyrite and galena has been found of shipping grade.——The Central mine, in the Mullan district, owned by ex-Governor Miles C. Moore, of Moscow, has been sold to W. D. Greenough. ——A strike of nearly 18 in. solid ore, which it is claimed carries 10% copper in addition to 20% lead is reported on the Interstate Co.'s property near the head of the East Fork of Nine Mile.

NEVADA.

CHURCHILL COUNTY.

Capt. A. O. Girard and J. H. King, of Oakland, Cal., are at Winnemucca, having, it is said, located the townsite of Bernice and developed a mine there to a point where ore is now being shipped. They are authority for the statement that water has been piped to the townsite, and that the mine is rich in antimony ore assaying 60% purity, without arsenic, zinc, or lead.

ESMERALDA COUNTY.

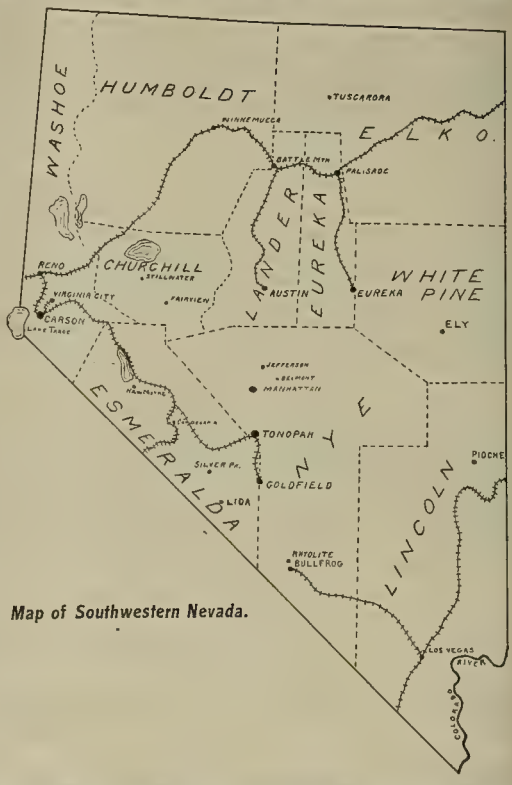
George W. Henderson, of Oakland, Cal., is now at Goldfield after making a trip to Tonopah and from thence to Silver Peak. He reports that there is now plenty of lumber at Silver Peak, and that building operations are being pushed. Work on the mining properties is also progressing in a satisfactory manner.

The merging of four of the richest gold-producing properties in western Nevada has been announced. George S. Nixon, James Wingfield, and others have completed arrangements for the absorption of the Mohawk, Jumbo, Red Top, and Laguna, with the formation of a new company capitalized at $50,000,000. The par value of the shares of the Goldfield Consolidated Mines Co. has been fixed at $10. The properties acquired by the company have been taken over on the following basis: Mohawk, $20 per share. Jumbo, $5 per share; Red Top, $5 per share; Laguna, $2 per share. These shares will be paid for in stock of the new company. It is understood this consolidation is being effected in order to avoid litigation. The lodes are flat, and the question of apex is likely to prove complicated, unless compromised.

The Frances-Mohawk Leasing & Mining Co. has installed the most elaborate machinery in Goldfield. It has one 50 h.p. and two 25 h.p. electric hoists, an air-compressor and a Rand-Ingersoll air-drill. This company also has the distinction of having the only cages and car system in the camp, with which they are able to raise 500 tons of rock daily. The shaft is down to the 280-ft. level; one million dollars in ore has been shipped to date.

LINCOLN COUNTY.

(Special Correspondence).—During the month of October the Quartette Mining Co. crushed in its 20-stamp mill 2,100 tons of ore, which averaged somewhat better than $25 per ton. Development work is being done on the 600, 700, 800, and 900-ft. levels, and there is more ore in sight now than ever before. G. B. Wilson, of Boston, who in 1898 advised the purchase of the claims which has since developed into the Quartette mine, has taken charge during the absence of the superintendent, Mr. Harrington, who was recently



Map of Southwestern Nevada.

stricken with apoplexy. The typical ore is quartz, containing much iron oxide; the gold yields readily to plain amalgamation. In portions of the vein copper, silver, and lead occur, and such ore is shipped to the smelters. A recent average car of shipping ore gave returns of 9 oz. gold, 8 oz. silver, 12% copper, and 8% lead per ton. C. A. Hopkins, of Boston, the principal owner, is now in Searchlight.—— Recent assays from the Stanley Forbes Mining & Milling Co.'s property show an average of $36 per ton. These claims border on the 4th of July mine. —— M. H. Best and M. J. Esberger, from Monrovia, Cal., purchased an interest in the Annette Mining Co.'s property this week. —— E. H. Sanford of the Fortuna mine in El Dorado cañon, has purchased a hoist and other machinery. The owners claim that they have the prospects of a large silver mine. —— The Wyoming Searchlight has struck water in such quantity as to prevent further sinking, pending the installation of pumping machinery. The water was struck at 245 ft., simultaneously good ore was encountered in the foot-wall of the shaft. A pump has already been ordered, and as soon as the water is under control sinking will be resumed. —— Work has been resumed on the Gold Dyke. They are driving to the south expecting to strike the big lode either from the Blossom or the Pompeii, both of which adjoin this property. —— The Searchlight Development Co. is building a 50,000-gal. tank to be used in connection with two other tanks in case of fire. A large pump is being put in and

connections being made so that the entire water supply of the town can be connected. These improvements will afford ample fire protection for the camp.

Searchlight, Nov. 10.

A strike has been made on what is known as the Channel City group, consisting of six claims located a little over four miles from Searchlight. The discovery is important because it opens up a new district. John M. Taylor found at a depth of 90 ft. a large vein running $21 per ton. This appears to prove that instead of the orebodies being confined to the hills and the district lying immediately west, the Searchlight valley for miles is underlaid by gold-bearing quartz.

NYE COUNTY.

Rich copper veins are said to have been found 30 miles southwest from Manhattan, across Smoky Valley to Bank Springs, resulting in a new camp. Over 1,000 claims have been located, and bonds are being taken on everything within a radius of six miles of the original strike. The low hills near the valley are covered with croppings showing the copper stain, and the district is larger than any copper deposit yet found in the State. It is near Bank Springs, which has been a watering place for travelers and cattle-drivers from early days, being on the direct line from Austin to Cloverdale.——Another strike reported 25 miles from Manhattan has resulted in the locating of a townsite named Copperfield. The copper is found as bornite, malachite, and azurite, and even in its native state.

A great scarcity of miners and labor generally is reported at Fairview, Wonder, and Hercules; the shortage in these districts is said to reflect a condition all over Nevada, due in some measure to the recent rush to the Walker Lake reservation, and to discoveries within the confines of the State. This condition is said to be sufficiently serious in the camps named to retard development.

WHITE PINE COUNTY.

The White Pine Gold Mining Co. has bought a mine in the Egan range, about 12 miles from McGills, from which some $200,000 worth of ore was taken in the old days. Under conditions existing when the mine was abandoned the main body of ore running from $20 to $80 per ton became unprofitable to work, the milling process then in vogue being of the crudest, and the nearest railroad 90 miles away. Since the White Pine Co. has taken hold of the property it has opened up two new veins, and has also opened up the contact.

The first payment on the Uncle Sam group of copper mines in the northern part of White Pine county, in the Bald Mountain district, was made at Elko Nov. 6. The purchaser is C. D. Galvin, of Oakland, Cal., who has been developing the property for the past four months. The mine will pass to the Copper Basin Mining & Smelting Co., the name of the company being descriptive of the ore deposit, which is found in a natural basin 1,200 ft. wide between porphyry dikes. This ore, as quarried from surface cuts, has averaged by carload lots 8.83% copper and $9.63 in gold and silver, as treated at the Salt Lake smelter. Mr. Galvin is also developing the Highland Nevada group of copper mines at Bullion, within 28 miles of Elko.

OREGON.

BAKER COUNTY.

John Arthur, superintendent of the California mine, states that the miners working under his direction have cut the vein 130 ft. from where they had been put at their work in tunnel No. 7.——The vein in the Sunnybrook mine continues to widen, and the completion of a road into the property insures a continuity of development work through the winter.

UTAH.

WEBER COUNTY.

Development work is being pushed on the Napoleon & Maghera mines in Sierra Madre mountain, north of Ogden. At the Santa Maria, in the same locality but in an adjoining cañon, the property of Don Maguire, work is also going on with as heavy a force as can be placed; this property embraces a system of seven copper veins showing outcrops from 20 to 80 ft. The new trail that has been constructed at great cost has made it possible to take in sufficient materials to insure continuous working through the winter.

WASHINGTON.

OKANOGAN COUNTY.

The Bonita mine on Slate Creek, near Twisp, northwest of Spokane, is again turning out bullion. Besides the 10-ton stamp-mill, a cyanide plant has been installed, and the two save 95% of the assay value of the ore. Ten tons of machinery, including a Lane roller and an electric dynamo of 400-h.p. is being sent to the mine.

SHOSHONE COUNTY.

The Stewart mine is being actively developed with excellent results. The orebody, which was five feet wide in adit No. 1, and 17 ft. wide in adit No. 2, is now an undetermined width at adit No. 3, but, it is reported, so far, nearly 30 ft. of solid shipping galena has been uncovered at the lowest level.

SPOKANE COUNTY.

The United States district court has confirmed the decision of Judge Beatty of Wallace, Ida., in the famous tailing cases, the court ruling that the dam put in by the Federal Mining & Smelting Co. has checked the pollution of land tributary streams for three years.——J. L. Hill, has discovered a vein of pure graphite on Sheep mountain, east of Spokane. The vein from which samples have been taken is 40 ft. wide. There is a parallel vein which carries more than a foot of shipping galena, which is rich in silver and averages $197 per ton.

The Bunker Hill Mining & Concentrating Co., has made a strike of importance in the Sullivan mine near Wardner, Ida., the orebody, 40 ft. wide, on the lower level being a little more than 1,200 ft. long. The ore reserve is so great that the management may erect another mill to handle it.

CANADA.

BRITISH COLUMBIA.

OUTPUT OF MINES AND SMELTERS IN THE BOUNDARY DISTRICT, FOR WEEK ENDING NOV. 10.

Mines.	Tons.	Mines.	Tons.
Brooklyn-Stemwinder	2,013	Skylark	20
Granby	13,114	Sunset	462
Emma	99	Smelters.	
Le Roi	1,290		
Mother Lode	2,170	Granby	14,500
Mountain Rose	165	B. C. Copper Co.	2,915
Rawhide	462	Dominion Copper Co.	3,222
Total tonnage shipped from mines			18,889
Total tonnage treated at smelters			20,667

The strike of the coal miners continues to affect shipments. During the past week only one Rossland mine—Le Roi—sent out any ore, and even its shipments were affected by shortage of cars due to lack of fuel on the Red Mountain railway. The stopes in this mine are full of broken ore, clogging them and getting in the way of the men. Other mines are getting in the same condition and will have to close down until the Trail smelter obtains a supply of fuel. Le Roi will keep up operations, having arranged for a supply of coke from Pennsylvania, which will enable it to run its smelter at Northport.

From the Boundary comes the news of an important deal by which the well-known Cariboo free gold mine in Camp McKinney, some 30 miles west of Midway, has been leased by a syndicate of Phœnix men. The lease includes the machinery and stamp-mill of the Cariboo-McKinney Mining & Milling Co., of Toronto, and was secured by R. B. Boucher, W. S. Macey, L. Y. Birnie, A. B. Hood, and associates. The Cariboo is one of the oldest claims in the Boundary, and has produced more than $1,000,000 of gold bullion, and has paid more than $540,000 in dividends. Work was discontinued at the end of 1903, and the extensive underground workings allowed to fill with water, remaining in that condition up to the present time.

The Ymir mine has treated more than 15,000 tons of ore at its stamp-mill and more than 1,000 tons of concentrate have been produced since the beginning of the year. A fine body of ore has been encountered in the west drift from a raise of 1,000 ft., and an orebody has been found at level No. 6 east. The aerial tramway at the Hunter mine will be in operation in a short time.

Personal.

CHARLES HOFFMAN is in Alaska.

J. PARKE CHANNING is in Arizona.

L. H. TAYLOR, JR., is at Mexico City.

A. C. BEATTY has returned from Paris.

F. L. BOSQUI has returned from Nevada.

ALGERNON DEL MAR is visiting Oakland.

J. P. HUTCHINS is on his way to Dutch Guiana.

LESTER W. STRAUSS is in the Yauli district of Peru.

EDGAR RICKARD is visiting New York and Chicago.

BEN. S. REVETT has returned to Breckenridge from New York.

W. H. RADFORD is expected in San Francisco from Alaska.

H. KILBURN SCOTT has left for the Caucasus on professional business.

CLAUDE V. HAINES has gone to Spain as manager of an important mine.

FRANK F. CASTELLO has returned to Colorado Springs from New York.

W. H. PAUL is the new manager of the Dolores mine, in Chihuahua, Mexico.

OSMOND E. LE ROY, of the Canadian Geological Survey, is visiting California.

PHILIP ARGALL is examining mines in Arizona, and will proceed to Nevada.

ROBERT S. BOTSFORD has returned to London from the Sansu mine, in Ashanti.

F. LYNWOOD GARRISON visited San Francisco this week to order mining machinery.

FRANK E. WHEELER, of Creede, Colo., is examining mines in Chihuahua, Mexico.

NATHANIEL WILSON has recently returned to Denver from an extended trip to Mexico.

FRANK C. LORING is now manager for the Trethewey Silver Cobalt Co., at Cobalt, Ontario.

ROBERT SCHORR is building a tramway for the Trinity copper mine in Shasta county, California.

B. F. GRANT is with the Palmerjo & Mexican Goldfields Co., Ltd., at Chinipas, in Chihuahua, Mexico.

J. D. JORDAN has resigned his position with the Mocking Bird Mining Co., of Mohave county, Arizona.

FRED D. FULLER has resigned as manager of the Oregon Smelting & Refining Co., at Sumpter, Oregon.

JOHN L. WITNEY is again superintendent for the Lowell & California Mining Co., at Bighorn, California.

JOHN N. MACKEY has been placed in charge of the Cœur d'Alene and Isabel mines, in Gilpin county, Colorado.

CHARLES FIELDING, managing director of the Mountain Copper Co., is expected in San Francisco from London.

CLAUDE HAFER is on his way to Mexico, to take charge of the Cinco Estrellas mine at Pinos, Zacatecas, Mexico.

CHARLES SWEENY, president of the Federal Mining & Smelting Co., has just returned to Spokane from New York.

WM. H. KINNON, who has been doing professional work in Utah, is now in Wyoming, and will shortly go to California, and from there to Mexico.

C. E. ALLEN, managing director for the United States Mining Co., of Salt Lake City, is at present at Eureka, looking over affairs at the Centennial Eureka mine.

W. S. MORSE, C. W. WHITLEY, accompanied by MESSRS. ECCLES and SPROULE, of the A. S. & R. Co., are at Ely, Nev., paying a visit to MARK L. REQUA, general manager of the Nevada Con. Copper Company.

OSWALD AICHEL, assistant superintendent of the Cia. Minera de Peñoles at Mapimi, Mexico, paid Berkeley a short visit while on his way to the Selby smelting works. Dr. Aichel has been on a trip throughout the western States gathering data concerning the latest smelting processes.

Obituary.

EBEN SMITH, one of the most enterprising leaders of mining in Colorado, died of peritonitis at Denver on November 6. He brought to Colorado the first stamp-mill, hauling it across the plains from St. Louis. He was one of the promoters and builders of the Florence & Cripple Creek railroad, bringing Cripple Creek into touch with outside smelters and reduction plants. Smith was also a pioneer of Leadville, and the first man to unwater the wet mines of that camp. For many years he was interested in the Bi-metallic smelter with D. H. Moffat, in whose mining enterprises he shared to a large degree. With Jerome B. Chaffee, Eben Smith located the famous Bobtail lode in Gilpin county. In Aspen deceased was interested in the Franklin mine and in the Aspen deep-drainage adit, and he operated also in Summit county. Eben Smith was a native of Erie county, Penn. At the age of 19 he was attracted to California by the gold excitement, removing to Colorado in 1860. The closing years of his life were spent in California. He leaves a widow and three children, and he will be mourned by a wide circle of mining men to whom he was a friend. In him Colorado loses one of a group of enterprising operators—ready to grubstake prospectors and to buy mines in new districts—who did much to stimulate the development of the State.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, November 14.

Argonaut	$4.70	Furnace Creek	$4.25
Con. Virginia	1.55	Savage	1.30
Mexican	1.48	Sierra Nevada	1.15
Ophir	3.50	Yellow Jacket	1.60
Belmont	6.65	Montana	4.10
Jim Butler	1.56	Mohawk	18.00
Jumbo	4.60	Red Top	4.30
Jumping Jack	0.50	Sandstorm	0.85
Manhattan Con	1.05	Silver Pick	1.60
Midway	2.85	Tonopah Ex	7.70

ANGLO-AMERICAN SHARES.

Cabled from London.

	November 8. £ s. d.	November 15. £ s. d.
Camp Bird	1 9 6	1 9 6
El Oro	1 7 6	1 7 6
Esperanza	2 11 3	2 10 6
Dolores	1 13 9	1 10 0
Oroville Dredging	1 1 9	1 1 9
Stratton's Independence	0 3 9	0 3 9
Tomboy	1 10 6	1 13 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

		Closing Prices—November 8.	November 15.
Copper—Lake (cents per lb)		22¼ @22½	22¼ @22½
" Electrolytic "		21⅜ @22	21.55 @22
" Casting "		21¼ @21½	21⅜ @21⅝
Lead	"	5.75	5.75
Spelter	"	6.28@6.31	6.36
Silver (cents per oz.)		71⅛	71⅜

CURB QUOTATIONS—NEW YORK.

	Closing Prices Nov. 8.	Nov. 15.
Bingham Central	2⅛	2
Boston Copper	31½	30¾
Calumet & Arizona	155	154
Cumberland Ely	13⅛	12½
Dolores	8⅜	8⅜
El Rayo	8¼	7½
Guanajuato Con	4¾	4¾
Giroux Con	12⅛	11¾
Greene Con	25¼	26⅜
Nevada Con	20½	20
Nipissing	29	30⅛
Tennessee Copper	44¾	45
Tonopah Ex	7¾	7½
Tonopah-Belmont	7¼	7¼
Tonopah	21¼	20¼
United Copper	69	72¾
Utah Copper	34	34

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE building of the United Engineering Societies at New York is now receiving its interior finish, and it is to be ready for inspection in December.

DURING the first nine months of this year the Bendigo district, in Australia, produced 172,678 oz. gold. The mining companies paid £206,252 in dividends and levied £156,247 in calls.

THE solution of potassium cyanide in pure water, from which all other substances are excluded, is entirely *without* action on metallic gold. The reaction begins only when air is supplied.

CONCRETE made of broken or crushed brick instead of stone gives excellent results for some purposes; but it always requires a larger proportion of cement than when less porous material is used.

THE Oliver Iron Mining Co. at Coleraine, in the western Mesabi range, has undertaken to remove 13,000,000 cu. yd. earth. The intention is to strip 80 acres to an average depth of 80 ft., in order to uncover a body of iron ore estimated to be at least twice as large as the overburden covering it.

ON the whole, with low-grade ores and dilute solutions of potassium cyanide, the cyanide solution itself will, if properly aerated, carry oxygen enough to dissolve the gold; so that artificial oxydizers are seldom needed, unless there is some reducing agent present in the water or the ore which will absorb the oxygen.

THE chemical reaction explanatory of the precipitation of gold in dilute potassium cyanide is supposed to be represented by the formula

$$2K\ Au\ Cy_2 + Zn = K_2\ Zn\ Cy_4 + 2Au$$

but, like all such formulas, it is inadequate to represent all the changes that occur.

WHEN copper is fused it possesses a sea-green color. Molten copper has the property of absorbing certain gases, such as hydrogen, carbonic oxide, sulphurous acid, etc., which it gets free again on solidifying. This causes serious difficulties in making castings, and requires the employment of special precautions to prevent porosity.

WHEN a dynamo is to be operated by a separate engine not on the same bed-plate, the foundation should be made common to both, or if separate foundations are necessary, set the two machines on a frame made of substantial timbers, or steel I-beams, which may rest on the double foundation. In this manner the engine and dynamo may be kept in perfect alignment.

THE cost of quarrying or excavating porphyry (for silicious flux in smelting), should not exceed seven cents per ton under favorable conditions. This would include the cost of blasting and delivering on cars. The most economic method is to drive short tunnels and blast several thousand tons of rock and handle the debris with a steam-shovel, or chute it directly into cars.

THE surveyor should keep his plans up-to-date and see that the men in charge of the mining operations fully understand their instructions; for many mining bosses of considerable experience get entirely wrong notions of the shape of their workings and are often too proud to ask for information. The surveyor, without assuming a know-it-all attitude, can, from the specialized nature of his work, often make useful suggestions in regard to the exploration of a mine. By working always in harmony with the other officials of the mine, he can further the interests of all concerned, both employers and employees.

THE most frequent cause of collapse among water-tanks is the corrosion of the hoops. This is a flat wrought-iron band, $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, which is seldom painted, so that it becomes subject to corrosion both from the outside and the inside. Hoops should never be less than $\frac{3}{4}$ in. diam., and they should be made without welds and thoroughly painted before and after erection.

THE power required to operate a belt-elevator is comparatively insignificant. The apparatus itself is in equilibrium, and only such power has to be applied as is necessary to lift the ore and overcome the friction. The theoretical requirement of power to lift 10 tons per hour to a height of 40 ft. is only 0.4 h.p., and allowing an equal amount for friction, the total is only 0.8 horsepower.

ALL minerals found in placers are not gold, nor even 'black sand,' nor platinum. In some of the placers of Colorado, especially those of glacial origin, there are found galena, zinc-blende, silver, and even copper carbonate and sulphides. The occurrence of these diversified minerals indicates that there has been but little movement in the debris since it was broken from the lodes on the neighboring hillsides.

EXPERIENCE generally has shown that it is necessary to grind pyrite very fine before high extraction is possible. In Western Australia there are a few exceptions, and also to a less extent, in South Africa. Fine grinding, not only of pyrite, but of silicious ore, is now commonly practised in Western Australia and also in California, and the best results everywhere will probably be obtained when pyrite is ground to 200 mesh.

IN making screwed joints in piping, it is best to use some compound, because pipe fittings and the threads on pipe ends are not always uniform, even when coming from the same maker. They rust and accumulate dirt before being used, so that threads do not fit precisely and fittings will leak. Most steam fitting is done in red lead. Graphite and oil are also employed and are efficient. Black asphaltum, about as thick as melted butter, is similarly successful.

AN ORE containing galena, sphalerite, and stibnite, with gold and silver is generally amenable to treatment, for such ores are successfully concentrated at various places. Ordinarily the galena, the specific gravity of which is 7.5, may be separated from the gangue and the other sulphides by hydraulic concentration. The blende and stibnite should be passed through an electro-magnetic separator, which should effect their separation. The specific gravity of blende is about 4 and of stibnite 4.5; they cannot easily be separated on vanning machines or concentrating tables.

AS between perpendicular and sloping elevators, the former generally adapts itself better to the construction of a building and permits a simpler arrangement of the machinery; it is less expensive in first cost and less expensive to keep in repair than the sloping elevator. The chief drawback is in maintaining a proper tension in the belt, as it stretches. This must be arranged by using a tightener, which is usually provided in the form of an adjustable boot. In the case of the sloping elevator, inclined at from 10 to 15° from the vertical, or more, the belt is self-tightening.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Tube-Mill Lining.

The Editor:

Sir — After reading about the proposed tube-mill lining to be used at the Waihi mine, in New Zealand, I thought it would be of interest to your readers to know of my experience with practically the same lining. We have installed a 12-ft. mill, made in the shops of this company (Oriental Con. Mining Co., of Korea), and, being slightly out of the world, it would have been a great saving to line our mill with ordinary hard quartz and cement such as described in the MINING AND SCIENTIFIC PRESS of July 28, 1906.

About nine months ago it occurred to me that if we could utilize our hard quartz, together with a proper

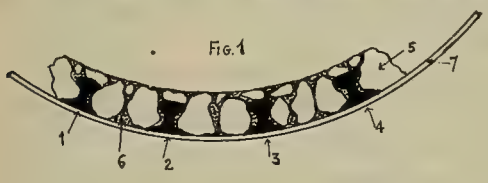


FIG. 1.

1, 2, 3, 4. Rails.
5. Quartz.
6. Mortar.
7. Shell.

cementing material, it would make an ideal lining for a tube-mill. The most important point was how to hold it in place within the tube. The mill was put together in three sections or sheets of iron and all well riveted hot. These sections we well knew would not be as good as one continuous sheet or tube, for they were liable to spring a leak around the rivets. This would mean a considerable

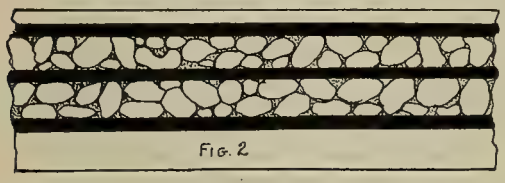


FIG. 2.

loss in our case, as we are grinding concentrate to a slime in strong cyanide solution. Therefore an arrangement that would give strength to the mill as well as hold in place the 'bull' quartz lining was wanted. Sixteen-pound rails were riveted lengthwise in the tube, six inches apart and around the total inner circumference. Diameter of tube is three feet. Fig. 1 and 2 show the arrangement of rails and the way the quartz and cement was held in place.

The best quartz for the purpose was found at the Tabowie mine. It was hard but not brittle, which seemed to be an important point in such a lining. All cementing material was made up of equal parts of hard coarse quartz, sand, and cement. Special care was taken to have the sand clean and fresh. A layer of cementing material was first put between the rails next to the shell, and spread out evenly. Next, large pieces of 'bull' quartz, 2 and 3 in. diam. were pressed into the cement as compactly as possible, and between these larger pieces smaller quartz was filled in with the cementing material. It was all tamped well, so as to fill the spaces with cement. Another layer of cement was spread evenly over the top and another layer filled in as before. The two layers brought the quartz about two inches above the rails, the upper layer serving as a protection. Every little space between the large quartz was filled with quartz and cementing material. Finally, on top of all was placed the mortar; this also was well tamped. The surface was smoothed with a trowel and then allowed to set. A strip or one-third of the mill was lined at one time. After two days it became sufficiently hard so that the mill could be turned over and another one-third lined in the same way. When the lining was complete, it was allowed to set for six weeks. This was more than was really necessary to become hard, but we wanted to have it thoroughly dried out, so as to have it in the best possible condition to wear. The inner diameter of tube was now about 2 ft. 3 in. Ordinary bull quartz, the same as used for the lining, was broken up in 2 and 3-in. pieces and used as pebbles for grinding, which proved to be very satisfactory. The tube was filled just a little over half full, which amounted to 1½ to 2 tons of pebbles. The material ground in the mill was concentrate, cyanide solution being used.

Now, in regard to the wearing of the lining, I can say that it was by no means satisfactory. At the rate it was wearing it would have only taken about two weeks to cut away all the lining. It was rapidly undermining the larger pieces of quartz—that is, the cementing material was gradually cut out. Wherever there was a space of cement between the quartz that was possible to wear, it was sure to be gradually worn away and cut out, allowing the quartz pieces to fall out. You cannot imagine the beating and wearing action the pebbles have on that cementing material. The quartz in the lining will stand alright, but the thing is to keep it in place. Even with silex linings, where the best quality of diamond cement is used, and where all the bricks are made to fit as closely

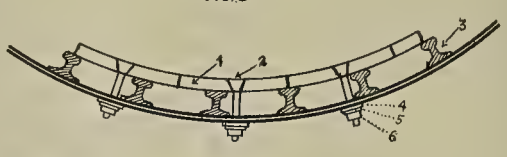


FIG. 3.

1. Steel plate liner.
2. Countersunk head.
3. Steel rail.
4. Vanner belt washer.
5. Iron washer.
6. Nut.

as possible, the pebble will, in spite of all, wear away some of the cement to a certain depth. Now, how can you expect ordinary or portland cement to stand where the spaces between rough pieces of quartz are greater? It may be easy to think in the first place that this lining is going to hold, but to make it is another thing. The lining appeared to be very hard before using and certainly ought to have been, for it had plenty of time to set. The principle of the lining is all right, but I am afraid we will have to find something a good deal harder than portland cement for a cementing material.

Cast-steel liners were the next to be tried, as we had on hand enough of stamp-battery liners (4 ft. by 9 in. and 1 in. thick) for our purpose. Before putting them in place the old quartz lining had to be removed from between the rails by means of a single jack and moil. It was no easy task, for it was hard and the rails held it in securely. The rails were left in and the steel plates put on top, being held in place by bolts with counter-sunk heads. The bolt extended out through the shell, and over this was put a washer made from a piece of old vanner belt. On top of this was an iron washer and then the nut. There were two bolts, one in each end of the plate, to hold it in place, and both were screwed down tightly. After a day or so of running, they were screwed up again. Probably it was necessary to go all over the bolts on the tube-mill a third time, but after this we never had any trouble with bolts leaking or getting loose. It was absolutely necessary to have vanner-belt washers next to the

shell. Fig. 3 will show the method of holding the liners.

The rails give the tube great strength, especially where it is put together in three sections. With these in place, there need be no fear of leaks starting around rivets, especially if the riveting has been done well.

These steel liners have now been in use one month and show only a little wear. At the present rate of wear these liners should last at least six or seven months more. About ten tons of clean concentrate per day pass through our 12-ft. mill. Two tons out of the ten are caught by the spitzkasten box and passed through the mill again as coarse concentrate, making eight tons ground to slime and passing into the agitators per 24 hours. The question of a cheap lining in out-of-the-way places like Korea is certainly one of great importance to tube-milling. If more would give their experiences concerning different inings, it would be of great value to us all.

A. E. DRUCKER.

Taracol, Korea, September 29.

Machinery Merchants and Metallurgists.

The Editor:

Sir—I read with considerable interest the remarks of W. H. L. which appeared as a letter in your issue of October 27 under the above heading.

While there is a great deal of truth in some of his remarks, he imagines that with one fell swoop he has unearthed a great evil which has but one cause, and for which he can see but one remedy. He presumes that all consulting engineers are above suspicion and almost infallible, and that every mining-machinery house takes pleasure in cheating its own customers.

As the representative of the engineering department of a large mining-machinery house, I take exception to your correspondent's attitude of mind and claim that it is unjust and that his remarks are misleading. I admit that there are abuses, but are the machinery sellers the only individuals to blame? Unfortunately the evil is a very general one and is found throughout the whole great sphere of commercial industry, wherever exchange and barter go on, whether the product be the brain and experience of the consulting engineer, the mines of the miner, or the machinery of the manufacturing house.

No doubt the large proportion of properly qualified mining engineers and metallurgists are good, honest, capable men, who do their best for their clients, but, unfortunately, many of them work directly into the hands of the salesman who will give them the highest commission. Others work deliberately into the hands of large corporations and deliberately turn down a good mine or a good process, if they think there is any chance of its being bought in cheap by 'friends.' Still others are professional 'hedgers' and will not handle anything that does not promise to redound to their credit, and thus the unfortunate mine owner who comes to them for advice is left in despair.

I can see no logical reason why the mining-machinery houses should not employ competent engineers to represent them and assist their clients. W. H. L. has no right to refer to this as "the gradual intrusion of the mining-machinery houses into the special field of the metallurgical engineer." If I am not mistaken, in the early days, many of the best men owed their training to a mining-machinery house and afterward branched out into independent consulting engineers. It stands to reason that a capable engineer in the employ of a large house has excellent opportunities to collect data and information which is invaluable to a prospective purchaser, and with the present ill-defined boundary lines between the engineer, the engineer contractor, and the purely manufacturing firms, it is not possible to refuse information to a customer.

The machinery house prefers to quote against a specification drawn up by an independent engineer; that is plain sailing and relieves them of all responsibility, but, like the reputable engineer and metallurgist, they have a future to think of and must make every effort to secure good results for their customers, or their failures will soon tell against their chances for future business. I have seen a good many plants condemned where, as W. H. L. points out, the fault was in the misapplication; and I have also seen a plant of machinery designed, purchased, and installed on the advice of a very well-known metallurgist, for the purpose of developing a mine, which I, as a mining-machinery representative, would have been ashamed to recommend to a client in view of the conditions extant at the mine in question. The development work was a failure, the mine was unjustly condemned, and the unfortunate owner was left in a hole about $80,000, when, if the 'metallurgist' had been thrown on the scrap heap and a little common sense used, the mine could have been made a success.

In regard to the establishment of ore-testing plants, I can see no reason why a manufacturing house should not maintain such an institution; in fact, it becomes almost a necessity when machinery houses are owners of special patented machines. Let us presume that a prospective customer sends down a sample of his ore with the inquiry "How can your machine handle my rock?" What could the house do but undertake a test and give some sort of a guarantee as to results?

It is also necessary for the convenience of customers who wish to carry on tests and experiments subject to their own supervision, and it in no way interferes with the legitimate business of the consulting metallurgist. On the contrary, it merely assists the re-solution of the preliminary problems and avoids the possibility of some of those fatal mistakes which W. H. L. takes so seriously to heart and with good reason.

The interest of all three parties under discussion may be safe-guarded by the use of a small quantity of that well-known but very scarce commodity, common sense. If this is applied with judgment by the mine owner, he will first go to a reputable machinery house for his preliminary estimates and to get some general idea as to whether his problem is a simple one or is likely to prove complex and involve more capital expenditure than he has at his disposal. When the machinery house finds that a customer wishes to get a great quantity of engineering knowledge for nothing, and that the problems to be faced are more within the scope of a consulting engineer, they will use the same common sense and refer their client to the best and most competent man that they know for the particular line of work under consideration. Further, I think that it may be generally conceded that it is the almost universal practice of reputable manufacturers to pass their customers along to each other when they know that they do not manufacture the machinery best adapted to their requirements.

I shall be pleased to hear further discussion of this interesting subject and will endeavor to reform my moral code in accord with the light that may be shed.

H. E. D.

San Francisco, November 9.

Who Is a Mining Engineer?

The Editor:

Sir—A railroad engineer is one who builds a railroad; a mechanical engineer, one who builds machines; a civil engineer, one who builds roads, dams, etc.; and so on, through all the profession of engineer—electrical, chem-

ical, metallurgical, etc. An engineer is the man who *does* things, who conceives and carries out works and methods of public utility that benefit the human race and make for progress. Therefore a mining engineer is a man who builds up the mining industry by developing and bringing into use the mineral stores which the "Great Architect of the Universe" has placed in the earth for the service of man. Titles acquired by examination or purchase or in other ways are of small account. I have several of them, but they did not make me a mining engineer. I owe a debt of gratitude to, and have unbounded respect for, the real mining engineer who has brought a mine to a successful issue, and I think he has more right to place E. M. after his name than many a college graduate. There is no branch of the great engineering profession that requires such a many-sided man as that of mining engineer, and all that colleges and technical schools can do is to lay the best foundation possible. A man may graduate in art, science, literature, etc.—but that any college can grant a degree as 'Engineer' by mere examination at the end of a three to five years' course is preposterous and misleading. An engineer is emphatically the man who *does* things—and until a man has built a railroad or some public work or 'run' a mine or smelter, etc., and shown that he is capable of translating learned terms into successful action, he has no right to call himself E. M., C. E., M. E., or any other kind of E.

WALTER E. KOCH.

El Paso, November 5.

Sectional Gold Dredges.

The Editor:

Sir—Continuing the discussion of Mr. Curle's article, I desire to say that the question of sectionalizing a dredge for mule transport over such rough country as the Andes is interesting, and there is no doubt that this may be accomplished, provided timber for the hull and spuds is available on the east side of the range, where a wider road than a bridle-path could be built. As to dividing it up in eight pieces, that is of course out of the question, because the machinery alone for a 3½-cu. ft. bucket dredge would weigh in the neighborhood of 160 tons, exclusive of motive-power machinery. One-eighth of this weight is 20 tons, and two mules, under such circumstances as stated, could not possibly take a load of more than about 600 pounds.

The following particulars of an interesting case of a dredge being sectionalized for a property on the Gold Coast are given me by Mr. C. Cline, formerly connected with the Risdon Iron Works: An English company, known as the Goldfields of Eastern Akim, about the year 1900, gave an order to the Risdon Iron Works, of San Francisco, to build a dredge for transportation from a point near Accra, on the coast of Ashanti, to a point some 60 miles inland, where an alleged dredging tract was situated. The native method, of carrying the load on the head, was to be used, and, as a good porter will only take about 200 lb. in this manner, it will be readily understood that the parts had necessarily to be light. Of course, many pieces could be slung between several natives. It is related that a case is on record of a gigantic native from the Sahara carrying 400 lb. in this manner.

It was intended to construct the hull on the ground, from native timber, so the question of lumber was eliminated. The tumblers were built in 25 to 30 pieces each, and as the upper one weighed 4,000 lb., this made the heaviest part not over 200 lb. The ladders, trommels, buckets, etc., were naturally all easy to sectionalize. As the dredge was to be run by steam, a boiler was necessary, and the intention was to transport the plates separately, the riveting to be done on the ground. The heaviest single pieces were the engine cylinders, which weighed about 1,000 lb. each. The tumbler castings, instead of being pressed onto the shaft by hydraulic press, were to be heated, the expansion being sufficiently great to give a tight fit when cold. At the last moment, when all was ready, orders were received by cable to rivet all sections together and ship as an ordinary dredge. This was done and the machinery was dumped on the beach at Accra. Internal trouble had arisen in the company meanwhile, and there was a stop to further progress. Some of the dissentient members formed a new company and ordered a complete dredge from the Risdon company, which it was proposed to transport by means of traction engines. This machine was also built of 3½-cu. ft. bucket capacity. Accordingly, three years after the first dredge had been shipped, a properly metaled road was built into the property at a cost, it is said, of £30,000. The work was elaborately done, the road surface being actually graveled, though the native carriers unfortunately avoided this and took to the old trail, preferring it because the gravel hurt their bare feet. Three traction engines—each of different design and of uninterchangeable parts—were sent out and proved to be a failure. One, I believe, only reached a point seven miles from the shore. Mr. Cline was finally sent out, and he transported and erected the dredge in six months. All circular parts were cased in wood and rolled along the road. The boiler-drum, to allow for the camber of the road, was built up with wood at the ends and also rolled in. The timber for the hull and framing was cut and framed on the ground, and the stacker-ladder was built of wood. The boiler sections were riveted and the 16-ft. tubes put in on the spot. The ground to be dredged was 14 ft. deep at the place of building and Mr. Cline ran the boat for four weeks after it was erected, but I have been unable to learn of its subsequent fate. As the ground had never been either drilled or, in fact, prospected, I fear that it is not hard to conceive the outcome.

The parts and weights for a 3½-cu. ft. dredge, as usually provided, are given in the following table, with the corresponding number of sections and weights into which each could be divided. The ground, however, to be worked by such a machine far away from proper repair facilities, etc., would require to be extremely rich to allow the feat to be undertaken, and it is doubtful even then whether it would prove practicable.

The following table* will give an idea of the weight of a 3½-cu. ft. Bucyrus dredge and the divisibility of its parts:

Name of part.	Total weight lb.	Number of pieces and their weight.
Upper tumbler	6,500	Can be cut in 20 pieces, one of which will weigh 1,000 lb., the rest will be below 300 lb.
Lower tumbler	4,500	Can be cut in 18 pieces, three of which will be about 700 lb., the rest below 300 lb.
Digging ladder	28,000	Two pieces of 600 lb., the rest about 300 lb.
Digging buckets (3½ ft.)	83,000	Bottom about 320 lb., each hood 135 lb., lip 120 lb.
Screen, stacker, and parts	16,000	Eight pieces would weigh about 600 lb. each, all other parts 350 lb. and less; 70% less than 300 lb.
Gearing	30,000	Eight parts would weigh about 700 lb. each, the rest from 350 lb. down; 50% less than 300 lb.
Engine or motors	15,000	Two pieces about 1,000 lb.; two pieces about 600 lb.; 50% below 350 lb.
Boilers	8,500	All below 350 lb.
Pumps	300	
Winches	42,000	Two pieces 600 lb. All other parts below 350 lb.
Other parts	7,600	All below 350 lb.

D'ARCY WEATHERBE.

Bisbee, November 3.

*Which we owe to the courtesy of D. P. Cameron, of the Western Engineering & Construction Co., of San Francisco, California.

Milling Gold Ores.

Written for the MINING AND SCIENTIFIC PRESS
By ALGERNON DEL MAR.

The fact that the stamp-mill still holds the field for the general milling of gold ore, and that the battery of five stamps has been found the most efficient combination, is worthy of comment, for many other types of machines have been tried and found wanting. Although as a simple pulverizer the stamp-mill is not an economical machine, its simplicity and the ease with which repairs are made more than offset any drawbacks. If well taken care of, there are only two wearing parts, the shoe and die, both simple forgings and easily replaced. The guides, tappets, and cams may last for years if ordinary care be taken, while broken stems are generally caused by poor material or carelessness, by allowing too much play in the guides or permitting pieces of keys or drills to get into the mortar. The wearing parts rarely cost more than 10c., and often as low as 5c. per ton of ore crushed, which is difficult to surpass, considering that the minimum amount of labor and other materials are necessary in conjunction. But when the stamp-mill is considered not merely a pulverizer, but a metallurgical apparatus for the extraction of precious metals, it is found that the simplicity of construction lends itself to a complexity in operation.

It is often commented upon that no material advance has been made toward a perfect milling machine. In one respect this may be true, for the stamp-mill is essentially the same as twenty years ago, the improvements being heavier parts and better foundations. As a fine pulverizer, the stamp-mill has been replaced or used in conjunction with re-grinding machinery such as pans, Chilean mills, and tube-mills, but only in cases where it is found profitable to treat a slime product by chemical means, and where the gold left in a sand product will pay for re-grinding and chemical treatment. This is seldom the case in California, except possibly with oxidized desert ores, but in any case it requires careful testing as an arithmetical equation.

The unit of 20 stamps on a cam-shaft has evolved to ten and frequently to five, and the number of stamps in a mortar has been changed from four to five; these may seem minor factors, but some years of experience were necessary to demonstrate which combination would be best. Units of less than five stamps have been tried, and, with rare exceptions, they have been supplanted by the regulation number, for not only are the latter better amalgamators, but require less labor to run. Take alone the question of screens and feeders, a five-stamp mill requires one-fifth the amount of work of five one-stamp mills; at the same time, the five one-stamps will crush half again as much as the five stamps.

Two objects are sought in every milling operation, the comminution of the particles of ore to such a state of division that the precious metals may be separated from the enclosing material and the extraction of these precious contents. A machine that will accomplish the first purpose may not fulfill the second. This fact is important and is often overlooked.

Unless in the hands of a competent metallurgist, it were best to install units of five stamps with a roomy mortar. This style of mortar can be filled in with a false lining, while the narrow-discharge mortar cannot be enlarged should the ore require the change. Other machinery will treat some ores better than a stamp-mill, but without detailed tests it should not be erected. A five-stamp battery, while not crushing as much per stamp as smaller units, is a far superior amalgamating machine. While in a five-stamp battery the pulp is washed back and forth, and remains some time in the mortar subject to the chemical or mechanical action of mercury or amalgam, in a one or two-stamp machine the pulp is expelled from the mortar as soon as it is ground fine enough to pass through the screen and overcome the height of discharge—conditions which are detrimental to inside amalgamation. It is not contended that this is the case with all ores, for where the gold is especially free and amalgamates easily on the plates, say, for example, gravel ores or where the principal extraction is by potassium cyanide, or where the values are almost entirely in the concentrate, a simple crushing machine may answer all requirements, but with most gold ores the metal is in a fine state of division or is mechanically covered or partially coated with some non-amalgamable material.

The general proposition may be thus stated, that while gold has a great affinity for mercury, it resists amalgamation unless the conditions are favorable to a union. These conditions are the physical state of the particles of gold as governed by the size to which the ore is crushed and the manner of crushing, the removal of all substances prejudicial to a combination of the gold with the mercury, and the condition of the catching surfaces. Now, it is obvious that a particle of gold has a better chance of being held by a particle of mercury the more often it is brought into mutual contact, and this is the case with milling most gold ores. Take, for instance, a one or two-stamp battery, the gold is forced out of the mortar almost as quickly as it is freed from the enclosing gangue. If a fine particle, it must catch on the outside plates or float off. If covered with iron rust or other material so that the mercury cannot find a bright portion to hold on to, it must necessarily go over into the tailing. The same is no doubt true of every battery, but in a lesser degree the more often these particles of gold are brought in contact with a bright particle of mercury. Once outside the mortar, the depth of water on the plates being so much less than in the battery, there is more chance of the particle of gold getting hold of air particles which aid the floating. Once caught inside the mortar the gold is as good as coin, but once outside it is a fight between the millman and all contrary influences; sometimes the fight is won, and sometimes the aid of a cyanide plant is brought into play as a last resort.

The scouring action inside the small battery is intensified, and it is difficult to obtain a good inside plate either of copper or corrugated iron, while with a five-stamp battery half of the gold content can usually be caught inside, and the plates kept bright and completely covered with amalgam. This is important, for as gold has a greater affinity for amalgam than mercury alone, the particles of gold inside the mortar are in the best environment to be caught.

Now, the small-unit batteries, lacking this ideal condition, are at a disadvantage in respect to refractory or fine particles of gold. By covering a copper plate with a screen (with half-inch holes) when the gold is bright and easily caught, good inside plates may often be obtained, but with low-grade ore or where the gold is not easily amalgamated, the scouring action will often keep pace with the deposition, in which case the inside plates had best be discarded, for scoured amalgam is difficult to catch on outside plates. Some gold particles will amalgamate more readily if dashed against an amalgamated surface, and for these particles inside plates are particularly efficient. This trivial peculiarity may be a determining factor in favor of a battery that provides this condition. I do not wish it to be understand that inside amalgamation cannot be conducted with a small-unit battery, or that it is always advisable, but where

advisable, the five-stamp battery is infinitely better; on the other hand, where fast crushing is essential, the smaller the unit, the better the result in tons crushed.

That a crushing machine is not necessarily an amalgamator is a fact; for example, in an experiment with a roller mill crushing dry, mixing with water and running over copper plates, less than 30% of the gold content was caught, while the same ore, after being reduced in a five-stamp battery over the same plates, has yielded over 80%. This experiment may be compared with one where the gold in a hematite-lime ore, while giving as good an extraction with a stamp-mill and cyanide plant, was more economically worked with a roller mill and cyanide attachment. This emphasizes a former statement that unless in the hands of a competetent metallurgist, it were best to be on the safe side.

Several mills in northern California, originally built with quick-crushing stamp-mills, have changed to the five-stamp type, with good results, and this is an experience that is repeating itself wherever the physical and chemical nature of the gold requires a particular state of division and offers a resistance to a combination with mercury. This resistance may be caused by a coating on the particles of gold or by some chemical constituent of the ore that affects the absorbing action of the mercury. The first condition is principally affected by the crushing, while the latter depends upon the millman.

While the general statement holds good that the size of the particle issuing from a mortar varies as the size of the screen-opening, it is seen in practice that the number of such particles and their relative sizes, depends upon other factors — that of the depth of the die below the screen-opening called the 'discharge' and the number and character of the splashes caused by the falling stamp. While the size of the screen-opening regulates the largest particle issuing from the mortar, it does not regulate the number nor proportion of the smaller sizes. This is controlled almost entirely by the depth of discharge. For example, with some ores when the discharge increases much above the height of drop, the feeders refuse to work automatically, the mortar rapidly fills up, and no discharge of crushed material takes place, the stamp striking the dies in spite of the amount of ore in the mortar. But from the point where the discharge and drop are equal, to the point where they are at their maximum ratio, the relative fineness of the material issuing from a mortar increases as the discharge increases. By regulating these two factors, of screen and discharge, any size or any proportion of sizes of particles of pulp can be had at pleasure, but the output is decreased in proportion as the discharge is deepened.

Extreme comminution has been advocated by some who claim that if an ore is pulverized fine enough, the gold will either settle in the mortar or will amalgamate on the plates. My experience, in Nevada and California, is directly otherwise; this extreme state of division causes flouring of both gold and mercury, which are then most difficult to catch, the tailing showing an increased value. For example, with an ore in Esmeralda county, Nevada, a 50-mesh screen crushing about two tons per day per stamp, gave $12 to $15 tailing, while the same ore, with a 30-mesh screen crushed about three tons per stamp, and the tailing fell to $6 to $8. This experience is one that is rather puzzling. Now, if the $6 to $8 tailing will cyanide, well and good, but if the amount left after cyaniding the sand will more than cover cost of re-grinding and treatment, and the slime gives a good extraction, this is a case for sliming the whole product, not in the mortars, but as a subsequent treatment.

Quick-crushing batteries are often used on account of the small outlay of capital necessary and with the idea of extracting sufficient metal to buy new machinery of greater capacity, but to the very fact that these machines are poor amalgamators must be debited the general result that the money for such improvements is not forthcoming at the expected time. The point I wish to make is, that for crushing fast a small-unit battery is preferable even with the increased attendance necessary, but whenever the question of amalgamating the pulp is considered, the efficiency of the five-stamp battery as an amalgamator will more than outweigh the inceased tonnage of the one, two, or three-stamp machines.



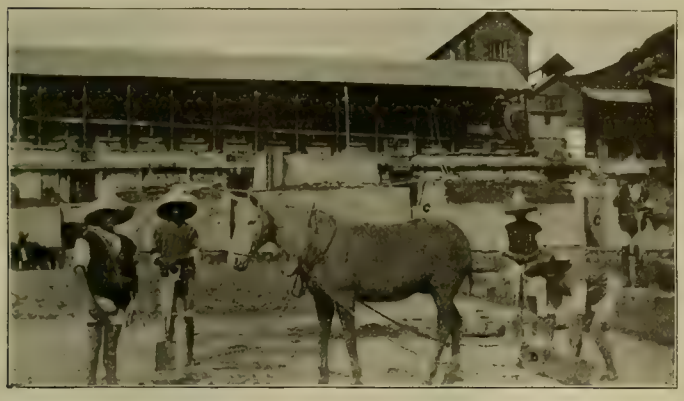
An Old Patio.

Three Weeks in Mexico---XI.

The Patio Process.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The pride of Pachuca is in its *haciendas de beneficio* or reduction works, of which there are seven large ones. Six of these are in operation and they treat 5,000 tons per week. Three of them are custom works; those of Guadalupe, La Luz, and Loreto are not. At the entrance of the *haciendas*, and even of private residences, one sees the big iron hoods of the mercury retorts. They



At the Hacienda de Guadalupe, Pachuca.

B. Sludge vats. C. Outlet. D. Scraper. E. Canal.

are buried in the ground, one on each side of the gateway and, being 5 to 5½ ft. long, they have the appearance of spiked guns.

The Hacienda de Guadalupe treats 900 tons per week, the ore of the Santa Gertrudis and Guadalupe mines. At the mine the ore is broken by hand, and picked over; the 'best selected' assays over 10 kilo. silver per metric ton and is sent to Europe, the second class, carrying less than 10 kilo. but over 2 kilo. per ton, is shipped to the smelter at Monterey, while the mine-run, containing less than 2 kilo., comes to the *hacienda*. Here it is screened to ¾ inch, the oversize passing through Cornish rolls, while the undersize is shoveled into bins. These are built of stone; they are brick-lined at the opening, whence the ore falls into cars that take it to Chilean mills. The oversize, after passing through the rolls, goes through a trommel (2 ft. diam. and 3 ft. long) with half-inch openings, the oversize going back to the rolls while the undersize falls to the ground, to be shoveled into cars, in which it is taken to bins above the Chilean mills and subsequently fed into them by shovel. There are 14 Chilean mills; the die ring (5 ft. inner diam., 6 ft. outer) and shells are composed of Siemens & Martin steel, made in Germany. The die lasts one year, the shells twice as long. There is an iron ring inside the steel shell. Each mill (inside diam. 1.85 m.) has six openings, guarded by 60-mesh screen, all on one side. The discharge passes into a vat, whence it is raised by a centrifugal pump to distributors above the 14 concentrators. This is a vanner—with belt 1.8 metres wide—known as the Johnston table and manufactured by the Risdon Iron Works, San Francisco. It does good work, the belt being heavy so as to give it the motion of a *batea* instead of being simply supported on a frame. The concentrate is shipped to Europe; it contains 14 to 15 kilo. silver and 100 g. gold per ton. The yield (from 900 tons of crude ore) is 21 tons per week, of which 13½ tons comes from the vanners and 7½ tons from canvas tables that receive the tailing from the vanners.

The tailing left over from this concentration process goes to vats or bins; these are structures built of masonry, 4 to 5½ m. deep. Here the pulp settles and the water is drawn off to a well, from which it is pumped for use in the mill. Stated briefly, the process of ore reduction consists in grinding fine with Chilean mills, extracting the heavy sulphides (with their associated gold) on concentrators and then treating the tailing (containing the bulk of the silver) by amalgamation on the *patio*.

On the flat ground below the terraced slope forming the site of the mill just described, there stretches the broad expanse of the *patio*, where the process of that name is carried out. *Patio* means a yard or enclosure, and the process derives its name therefrom. The *patio* of the Hacienda de Guadalupe is the size of a city square, it is paved with stone and divided into rectangular spaces, 30 by 25 metres, in which twenty separate charges or *tortas*, each weighing 300 tons, are undergoing various stages of treatment. Each bin or vat that holds the pulp or tailing, from the concentrators, has a vertical opening 5½ ft. wide which is kept closed by a series of boards (6 to 9 in.) These are removed one by one so as to allow the sludge to flow along the canals—3 ft. high, 6 ft. wide and built of stone—that lead into the *patio* itself. The flow of the sludge is assisted by a scraper (*camon*) pulled by a horse. This scraper is a plain plank, two inches thick, to which chains, connecting with the traces, are attached, as shown in the accompanying photograph. *El camonero*, the horse that does this duty, must be strong, for the work is hard; he scoops the slime along, to the accompaniment of much splashing and the encouraging shouts of the driver who controls the operation. Openings, at various points along the canal, serve to distribute the slime to separate rectangular stone-paved spaces, where the chemical work is done. Each rectangle, 25 by 30 metres, is deliminated by two timbers—4½ by 8 in., placed one over the other so as to make a wall 16 in. high. The *torta* which they enclose is 30 cm. thick.



Hacienda de Guadalupe, Pachuca.

A. Johnston vanners. B. Sludge vat. C. Outlet.
In foreground, horses stirring the charge.

The slime or *tama* is allowed to thicken, by loss of moisture through evaporation. Then comes the addi-

tion of the first chemical, common salt, which is thrown over the charge like a shower of hail. The salt is obtained from the lagoons near Zacatecas and is added in the proportion of 6 to 7% of the weight of the ore. This is an excess, but it is found to accelerate action and to diminish the consumption of mercury. After this part of the process, called *ensalmorar*, the mixing or *repaso* begins. This is done by the trampling of horses. One man, himself on horseback, drives 12 horses, four in a a row, tied by the neck to each other. The crackling of the whip, the slushy tramp of the horses, and the shouts of the driver give animation to the scene. This goes on by day only, from 7 in the morning until 2 o'clock in the afternoon. After the day's labor, the horses are driven through a big tank to be cleansed, when more shouting and splashing enlivens the *hacienda*. This mixing continues for 24 to 30 days. Each afternoon every portion of the *torta* is turned over with shovels in the hands of 12 to 15 men. After the first three days comes the addition of copper sulphate (bluestone) followed by further mixing and then the mercury is introduced. The 'bluestone' comes from the United States; it is added to the *torta* in the proportion of 0.4 to 0.6% of the weight of the ore. In looking over a *patio* in which the charges are in various stages of treatment, some just salted, others just showered with copper sulphate, the contrasts between the rectangular patches of white and blue leaves a vivid impression. The mercury is added in the ratio of eight to ten times the amount of silver estimated to be in the charge undergoing treatment. It is carried in a cloth, folded like a bag, and swung freely, so that the mercury squeezes through in the form of small globules. This is done to ensure thorough assimilation; the operation being appropriately termed *incorporación*. Five or six men perform this work, on the fourth day. At the end of the process (after 24 to 30 days, as determined by test) more mercury is added, in the proportion of 5 kilo. mercury for each kilogram of silver present in the charge, making about 2,500 kilo. to each *torta*, this being introduced for the purpose of collecting the amalgam already formed. This operation is termed the *baño*. During the continuance of the treatment the *torta* is tested by panning samples in clay saucers, 6 in. diam., called *jarros*. The operator pans the stuff down to a button of mercury and squeezes it between the thumb and index finger, to test its consistence, a flat bit of amalgam remaining, of a size indicating the extent to which amalgamation has proceeded. The rejected sand from this panning undergoes the ordinary fire-assay; when there is no further decrease in the content of this tailing, complete extraction is indicated and mixing in the *patio* ceases.

Then the horse with the scraper (*camon*) is employed to move the charge forward to a sump or *lavadero*, the *patio* being finally swept clean by 12 to 16 *peones* with brooms; the mercury can be seen in small pools and is splashed about during the manipulation required for this clean-up. The charge is moved to a sump or basin (*cajon*), 8 by 10 ft., where seven men, standing in water just over their knees, stamp around, and stir the stuff, while clean water is being added and fresh material is being fed from the *patio*. The top of the sump is on the same level as the *patio;* the bottom is six feet below the level of it and is enclosed in masonry, except on the lower or outlet side, where there is a barrier made of two boards that are perforated with 3-in. holes, twelve of them, in clusters of six each. The amalgam and mercury collect at the bottom, while the overflow drops into large cast-iron hemispherical basins (*apuros*), of 2½ ft. diam., which serve as traps. There are five of these, distributed along the exit-sluice below the sump. From the last *apuro*, the pulp flows over two parallel sluices with riffles, and in this 12 to 16 boys, 8 to 9 years old, stamp around to aid the separation and arrest of any escaping amalgam. These little fellows, chocolate colored, with big straw hats and thin bare legs, are kept on the move, so as to stir the slime; they wade around at the bottom of a canal 10 to 12 ft. below the level of the *patio*. They receive 37 *centavos*, or about 20 cents U. S., per day. Most of the amalgam is caught in the sump and in the first two *apuros* at the head of the sluices. This clean-up occupies 16 to 17 hours. Finally, the rich deposit at the bottom of the sump is washed, one of the boards of the lower barrier being removed, while fresh water is turned in. What amalgam gets out of the sump, lodges in the first (and biggest) *apuro*. At the very end of the operation more water is added; the *peones* use scrub brooms and sweep the bottom clean. The amalgam and mercury make a big showing; they are lifted in iron ladles; these are the flasks in which the quicksilver is bought, their tops being cut off, and an iron handle inserted. From 1,500 to 2,000 kilo. amalgam is obtained from the clean-up of a single *torta*.

Six hundred horses are used in the *patio;* they last four or five years, if young; the older ones last only six months. They become poisoned by the copper sulphate; hence the washing each day. Some of the horses are found to gather a lump of amalgam in their stomachs, as much as half a kilogram, say, one pound. This used to be removed when the horse died, but now the Government claims the deceased animal, without permitting dissection, and it goes to the crematory. What happens to the silver amalgam is not stated.

The extraction is 80 to 85%, the tailing (*jales*) containing 100 to 150 g. silver, say 3 to 5 oz. per ton. The gold is caught in the concentrate on the vanners; practically none of it is saved on the *patio*. Nevertheless, down the creek there are two plants that re-work the tailing from the *hacienda*. To anyone accustomed to stamp-milling, it is surprising how the mercury is splashed around. The pavement of the *patio* itself must absorb some of it, for this pavement is made of slabs; these are irregular in size but usually 1 by 1½ ft., of of volcanic stone, a basalt called *recinto*.

In another part of the *hacienda* one can observe the working of a mechanical mixing machine, designed to be a labor-saving modification of the *patio* process itself. In a rectangle, 20 m. wide and 75 m. long, a plough, with eight blades, moving sideways, travels up and down. It is operated through a ratchet gear by a man who sits on the machine, as it is pulled by an endless cable of one-half inch diameter. This treatment requires 45 days and gives the same extraction as the ordinary *patio*. The superintendent prefers the old-fashioned horse method because it requires less time. It can be said truly that the trampling of the animals affords a better aeration of the charge than the mechanical plough, which appears to go through the sludge rather than turn it over. There should be more turning of the furrow.

Mechanical devices in place of animals were tried long ago and they have been used in different parts of Mexico, especially Sonora. In M. C. Roswag's 'Metallurgie de l'Argent,' there are descriptions of such substitutes, which in English are called 'kneading' machines and in Spanish *repasadoras*.

Other observations are permissible. The small boys who tramp about in the tail-sluice give their toes as riffles to assist the settling of escaping particles of amalgam. The stirring in the clean-up sump as done by seven grown men has its humorous feature, but it is effective. The method of moving slime onto the *patio* by the *camonero* is an absurdity at first sight, but it obviates a costly conveyor, and both horses and men are cheap at Pachuca. The Chilean mill affords better grinding than

the pounding action of the stamp, although it seems strange to see the *peones* shoveling into the mills and then taking a rest, when a mechanical feeder would do it so nicely. The temporary canals made between the *torta* and the sump, to confine the passage of the pulp, are kept tight with manure, the droppings of the animals in



Men Cleaning the Patio at the End of a Treatment.

B.B. Sludge vats or bins. C. Outlet. E. Canal.



Where the Clean-up Takes Place. Men Sweeping Out the Sump or Basin.



Sweeping the Mercury and Amalgam Into the Sump; the Last of the Charge on the Patio.

the *patio*, thus contributing smells to the sights, a combination not uncommon in Mexico. There is a striking contrast between the modern vanning tables and the *patio* itself, the whole picture exhibiting a sublime disregard of all modern mechanical ingenuity as applied to the handling of material.

Ventilation at Bendigo.

With a view to improving the underground working conditions of the mines at Bendigo, the following suggestions were adopted at a conference of the mine-owners, mine-managers, and representatives of the Miners' Association: (1) That close timber should be placed in all shafts and divisions of shafts where there are connections with adjoining mines to the bottoms of shafts; (2) that all shafts sunk deeper than this stage should have four compartments; (3) that all levels not in work should have doors at the shaft to shut off the air current if necessary; (4) that doors be put in the down-cast divisions of shafts, except at the bottom division; (5) that all ladder compartments be left fully open at and above the surface; (6) that the exhaust of air-winches be turned into the sinking-compartments of the shafts; (7) that either air or water jets and pipes be put into raises and dead ends of cross-cuts and levels; (8) that cages and trucks should not be left hanging in shafts or at the mouths of shafts, when work is discontinued, thereby practically stopping all ventilation until work is resumed; (9) that in future sinking, if there is no fourth compartment, it should be mandatory to have a chimney constructed behind the shaft timber before the penthouse and cistern are put in position. It was further decided to ask the Government to install a Root's blower in one of the deepest mines for experimental purposes and to give the same a fair and satisfactory trial of not less than six months, all costs and supervision to be provided by the Government. These steps are due to recent investigation made by Dr. Summons.



El Camonero.

Copper Mining in Cuba.

Written for the MINING AND SCIENTIFIC PRESS
by BENJ. B. LAWRENCE.

Cuba has had, in the past, one copper mine worthy of the name—El Cobre, in the Province of Santiago, on the extreme eastern end of the island. The history of this property is well known to those conversant with the literature of copper. Fifty years ago it was famous as a producer of copper ore, which was shipped to England and to Baltimore. It has a record of production which has been variously estimated at between twenty and thirty millions of dollars, and its extensive workings give evidence of a large output. About three years ago an American corporation was organized for the purpose of freeing this famous mine from water. Owing to many difficulties, due largely to the fact that the old workings were badly caved, the efforts to recover the lower workings, which were at a depth of 1,200 ft., failed, and the property was once more allowed to be flooded. Sufficient work had been done, however, to show that substantial bodies of copper ore had been extracted from a mineralized zone comprising three or four veins running parallel for a distance of at least 5,000 ft. laterally, and actually worked to a depth of 1,200 ft. About $800,000 worth of copper ore was shipped to the United States from the old workings of this property before they were abandoned. The veins, averaging seven feet in width, occur in an andesite, brecciated. Many old stopes were found 20 and 30 ft. in width.

The ore extracted from the surface workings was for the most part oxidized and rich in chalcocite. At a depth of about 50 to 60 ft. the oxides were replaced by chalcopyrite accompanied by iron pyrite in a silicious gangue. The sulphides showed an average content of 6% copper. The ore contained neither silver nor gold in paying quantity.

The hills adjacent to Cobre give evidence of the existence of other veins, which are now being prospected with a view to opening up virgin territory on this property. On the extreme western end of the island, in the Province of Pinar del Rio, there are substantial gossan outcrops from 150 to 200 ft. wide. Under this, at a depth of 40 to 50 ft., iron pyrite containing black copper occurs. These deposits promise to be extensive, and in some respects resemble the ore occurrence at Ducktown. In the Province of Santa Clara there are several copper showings of sufficient merit to invite the attention of the miner. This might also be said of other locations in Cuba yet unexplored. The iron and manganese mines of the island are being developed by several American companies.

It seems quite evident that the mineral resources of Cuba have not been systematically explored; especially is this true of the mountains back from the coast, where, owing to unsettled conditions in the past, but little work has been done. It has been the belief of a number of engineers that Cuba presents opportunities for intelligent prospecting, and it is much to be deplored that the Cubans have failed at this time to maintain a stable government on the island, when its resources were beginning to attract the attention of capital.

It is quite evident that if its mineral is to be developed at all, Uncle Sam must step in and take a hand in straightening things out. Many Americans living in Cuba since the Spanish war seem to be of the opinion that until the United States takes control of the situation no substantial advance can be made in placing Cuba where it should be—a producer of copper and iron ore. In justice to the administration of President Palma, it may be said that Americans have received every encouragement from the Cuban Government; they have met with uniform courtesy; they have been protected in their rights, and have enjoyed peaceful possession of their property.

THE CONTRAST BETWEEN crystals on the one side and animals and plants on the other is obvious. There is with the former no change or development, neither progress nor degeneration, no survival of the fittest, no variation of character. Crystals are perfect and complete, each in itself. No struggle for existence takes place in the mineral world as it does among the individuals of the animal and vegetable kingdoms. It may be said that this is natural because no individuality obtains in the mineral kingdom, and hence it is absurd to look for any development among rocks and stones. But is this so? Individuals exist in the mineral kingdom just as they exist among animals and plants. Each crystal is an individual capable of growth by itself and independent of its fellows; each pursues its own existence. It is even in a sense capable of multiplication, for if a crystal be broken, each half can grow to a perfect individual, resembling the parent. Super-saturated solutions will immediately produce myriads of crystals from the parentage of one crystal fragment.

Mutilate a growing crystal by breaking its corners and edges, and it will heal itself and form a perfect crystal, asserting its individuality more persistently than many a living organism. If the definition of life be based on individuality, as some philosophers say, it will be difficult to exclude crystals. On further pursuing this comparison between the inorganic and organic world we are led to irreconcilable differences. In the organic world there is an unceasing change, involving progress or degredation. The beauty, the form, and the character of living things is due to the continuous interaction with the forces of nature. Minerals remain constant and complete. There is no change, no response to external stimulus, no adaptation to environment. The only change is destruction and loss of individuality. True it is that a crystal of pyrite will change to limonite, but here the individuality is lost and destroyed and a new one produced. There is no change, no progress of the individual.

The symmetry of living things is obviously due to their environment or to their movement. But in the crystals it is inherent, essential. It belongs to the mineral independently of external forces. When we pass from the crystal to other inanimate objects, this is no longer the case. The form of a mountain depends partly on the nature of the rock of which it is formed and partly on the action of the water, the wind, and the weather to which it is exposed. The durability or weakness of the granite or shale contribute to the curve of the coast line and the contour of the cliffs, but the rise and fall of the tide, the prevailing winds and currents, each show their influence by indelible marks. Thus we find in crystals none of the essentials of living organisms, progress or degredation, evolution, and influence of environment, but a constant, immutable individuality, a symmetry essential and inherent. It is the homogeniety of crystals that widens the chasm between animate and inanimate objects, for nowhere do we find this remarkable similarity of parts in any living organism. In the beauty of the organic world it is possible to imagine both an origin and a purpose; the origin may be conceivably sought in utility. They may have become useful because they are beautiful or it may be that they appear beautiful because they are useful. But in the mineral world it is different: These wonderful spars and gems have an infinite variety of form and color, they possess an intricate grouping of silky fibres and pearly flakes. What is the origin and what the object of all this beauty? What purpose does it serve in the economy of nature?—D. F. C.

The Iron Ore of Shasta County, California.

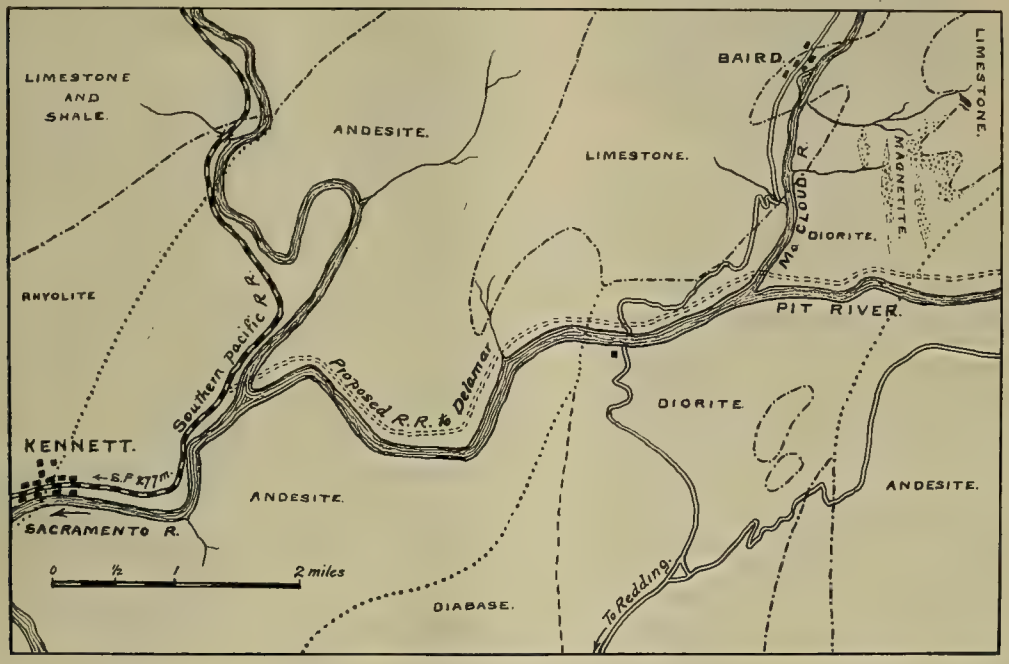
Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

The occurrence of extensive deposits of iron ore in the Shasta county copper belt is both interesting and important. Not only is there an enormous tonnage of low-grade iron ore occurring as a gossan, capping the great sulphide lenses, which form the copper deposits, but also there occur masses of magnetite of remarkable purity. These are sometimes intimately associated with the copper deposits, especially at the southern end of the belt and they also occur in the less productive part of the district.

The gossan cap of the copper mines carries 50 to 55% iron, and gold and silver varying from traces to about $40. The distribution of the precious metals seems to be erratic and no generalization can be made, though high values in silver ore are often found immediately above the sulphides. This ore is of a light and porous nature and is often traversed by veinlets of secondary quartz.

These deposits are the result of oxidation of the sulphide orebodies, which have been formed by replacement of the country rock by sulphides. Evidence of this is found in the occurrence of primary quartz phenocrysts in the gossan that can be readily distinguished from the veinlets of silica of secondary origin. In contrast to these gossan masses there occur bodies of heavy massive hematite and magnetite. The hematite has a characteristic black appearance and is often mistaken for magnetite. The origin of the deposits at the southern end of the belt is obscure, but it is interesting to note that traces of oxidized copper and zinc ores such as calamine, cuprite, and malachite have been found, though no sulphide is known to underlie these heavy iron ores. Their massive structure and compact nature suggest that pyrrhotite may have been the original mineral.

The saddle lying between the Pit and McCloud rivers near Baird is a mass of highly metamorphosed diorite carrying important deposits of iron ore. The geology of the district is complex. On crossing the divide, over which the steep and crooked road from the ferry winds its way, one looks down on the McCloud river and across a series of volcanics of varying ages and acidity. These find expression in characteristic smooth but steep hills, while at the back, the towering masses of sedimentaries form a rocky setting of gray crags and rugged pinnacles, framing one of the most beautiful river scenes in northern California. The tongue of diorite, east of the meeting of the waters of the Pit and McCloud rivers, is traversed by lenses of iron ore increasing in size and frequency as the limestone contact is approached. The diorite is characterized by quartz and augite, the latter being probably the source of much of the iron. In some cases these lenses reach a width of about 50 ft., but the country is undeveloped and the brush makes any detailed investigation a matter of the greatest difficulty. Traces of pyrite occur and one of the best exposures is to be seen in a short tunnel near the top of the 'hog back.' The origin of the deposits is interesting and is proved by specimens which can be found in all stages of alteration. Pyrite and a pyroxene, probably hedenbergite, gradually pass into limonite, and the latter preserves the fibrous structure of the pyroxene or the form of pyrite. The composition of the masses of iron ore is as follows: Iron, 68.5; P, 0.01; Si, 1.06; Mn, 0.37; S, 0.009 per cent.



Map of Portion of Shasta County, California.

The minerals associated with these deposits are typical of such a metamorphic area. Garnet and idocrase occur in quantity associated with hedenbergite of secondary origin.

Such a wholly undeveloped district, full of evidences of intense metamorphism, adjoining limestone known to contain deposits of oxidized copper ore, suggests the possibility of cupriferous sulphides in depth and there is an element of promise that pyrrhotite, with nickel or cobalt, might be found. It is satisfactory to note that these deposits are at last receiving some attention from the industrial world and that experimental works are being erected to test the feasibility of treating these ores by the Heroult process. These experiments should win the attention not only of local speculators, but of everyone interested in this process recently described by Dr. Haanel as a commercial success, for therein may depend the future of an iron smelting industry on the Pacific Coast.

Moss Copper on Matte.

Written for the MINING AND SCIENTIFIC PRESS
By CHARLES S. PALMER.

The formation of common moss copper on certain kinds of matte is too common a fact to need any description, but the beautiful deposit, which can be found in every assayer's cabinet, is itself an illustration both of the neglect that many interesting freaks of nature may suffer in the face of the sternly practical, and also of the very latest application of theory to practice.

Some years ago, when in charge of the chemical laboratory of the Washoe smelter at Anaconda, Mont., I had an opportunity to collect many of the by-products of the regular process of reduction. The mattes were a never-ending object of wonder. Some of the old furnace-men seemed to regard the appearance of some moss copper on the surface of a matte as an evidence of its high-grade character; others regarded it as an accident, indicating merely that the matte in question was not of the lowest grade. In my observation, the best grades of 'white metal' show comparatively little moss copper, yet I have never seen a piece as large as one's fist that would not show moss copper somewhere about it, especially in or near a cavity. This is more easily seen with an ordinary pocket lens.

In my study of mattes—I shall use the term in its widest meaning—I found many curious facts, one of which I wish to record here; partly wishing that other chemists may substantiate, or enlarge upon, my observations, and partly with the hope that some metallurgist, with a laboratory and suitable apparatus, may subject my work-a-day discovery to the careful test that it deserves.

One great advantage that I had at Anaconda was the friendship of the chief sampler, who kindly kept me informed of any changes or alteration in the great plant that would be apt to furnish new specimens for the student; and one day, when Mr. Thomas told me of the wrecking of two of the old reverberatories, in place of which one large long reverberatory was to be built, I took the first available chance to leave the laboratory for a half-hour and watch the work of digging away the old furnace-bed. At the reverberatory building, the foreman, Captain Kelley, gave me every opportunity, which I enthusiastically accepted; in fact, almost too enthusiastically, for the furnace-bed, in places, was a mass of matte still hot, and in my eagarness to get some particularly fine specimens I burnt some fingers which had become used to the ordinary burns—and here is the whole point of this discovery.

The matte in question was a beautiful dark bluish-purple, much like some of the finer grades of native bornite, only there was no varying nor iridescence in the color; it was one comparatively uniform dark bluish-purple. I took the samples out of doors where the light was better and studied them with some care, for this was the first time that I had secured such fresh samples of this kind of matte. While I was studying the samples, I noticed that there was but little moss copper showing on the surface. I was particularly careful to note this point, because I was at that time trying to establish some sort of a relation between the quantity and quality of the moss copper with the particular grade of matte.

I took the samples—the pieces were not large—up to my room and laid them on my desk. They were still so hot that it was necessary to lay them on several pieces of thick paper to keep them from burning the wood of the desk. I turned to some reports which were waiting and in fifteen or twenty minutes later I looked again at the mattes. I at once noticed two remarkable things: First, they had changed their color; second, they were still hot, when ordinarily samples of this size would have cooled down so that they could be easily handled in the fingers.

Under the lens, the change in color was at once explained. The change in tint to the naked eye, was from a dark bluish-purple to a brighter reddish-purple. The lens showed that the new tint was due to the blending of the bright red of newly deposited moss copper with the old color of the general surface, the dark bluish-purple. The fact was interesting, for I had the good fortune to catch the matte in the very act of sweating out some moss copper, an operation that I had previously supposed must take place at a much higher temperature than would allow of direct observation. There was no mistaking the fact of the change in color, and the cause of it, namely, the sweating out of the moss copper, largely since the samples had been handed to me. I may add that, when I had visited the bed of the old furnace, the workmen were still playing water over it, and the steam was being formed in clouds; indeed so violently that at the time, I was warned that I would be burned. Fortunately, I was sufficiently enthusiastic to run the chance of being burnt, for I caught the matte in the critical stage.

So much for the change in color, and the attendant sweating out of moss copper. But what of the long contined staying at a comparatively high temperature? That was also a fact, the significance of which did not at once occur to me. However, on a little reflection, the explanation was simple and clear. It was a case of 'solid solution,' of the new physical chemistry, exemplified by a happening in daily life. Let me illustrate. This particular matte had dissolved a large quantity of copper; more in fact than it could hold in molecular proportions with the iron and sulphur, and for the particular compounds which would be most stable at the temperature of solidification, and which therefore would be just the ones that must be formed. Disregarding other ingredients, the copper was largely in excess; each molecule would even off its molecular peck or half-bushel, just as we have seen an old miller do with the half-bushel of the old mill, where he would draw a smooth stick across the top of the measure, scraping off the excess. In some similar way—not to press the metaphor too far—each molecule of the matte measures itself off; the excess copper is pushed out, and, note it well, with some little evolution of latent heat. The many small fragments of excess copper fall together (by 'accretion'), and are extruded from every available surface. This tendency of the copper to find its way to the surface is evidence of a considerable pressure in the inside of the mass of matte.

The query comes up: Why can all this happen when the matte is practically solid? This is easily answered. A moment's reflection will remind us that, in an exact sense, there is no such thing as an ideal solid. What we call solids are only very tough and viscous liquids. Given pressure enough, and time enough, and one could press any solid to any shape, provided that one could find the machine capable of exerting the necessary pressure. Fortunately, we have one in the cooling matte. Moissan, the great French chemist, found another in the cooling mass of cast iron or steel, when he made diamonds artificially.

But there are two or three other points about this observation that may be easily illustrated. The latent heat given off by the 'solid solution' of the excess copper in the matte, is illustrated in the old experiment that we used to try when we were boys; the one where we made a supersaturated solution of Glauber's salt (sodium sulphate). On cooling this in a quiet place, it would reach the temperature of the ordinary living-room without letting any of the dissolved Glauber's salt separate; but, when we opened the mouth of the closed flask in

which the solution was made, the whole mass of liquid at once solidified with the production of a considerable amount of latent heat of solidification. A similar thing happens in the case of the 'solid solution' of the copper in the matte; although, in the latter case, the process is gradual rather than sudden.

But there is another fact, which might escape notice, that is equally interesting, and which throws light on the explanation, almost to proving the probable correctness of the explanation; it is this: The same pocket lens shows that some of the small wires or hairs of moss copper are smooth as though they were wire-drawn; while, on the other hand, some of them have many small knots, like a half-fused string of small beads. Here we see a case of partial crystallization, each bead standing for one small attempt in that direction; and the fact shows that at the moment of ejection from the mother mass of matte the copper, which was flowing out in small streams, was practically a liquid; as such, it naturally took its chance to crystallize.

Thus the making of common moss copper from matte is a fact that is still full of great promise; it is an illustration of the new theory of solid solution; it should have some practical use and application. Perhaps it has; perhaps it has been used in some well-known methods for the recovery of the precious metals; and perhaps one large smelter near Denver could tell a longer and more interesting story of this particular practice than it is yet ready to reveal to the public.

LOSSES IN CONCENTRATION.—The conducting of the various processes used in ore dressing needs constant watching in order to prevent losses, not only by the escape of valuable minerals in the tailing, but by enriching the desired mineral beyond the economic point at which concentration should cease. A system of sampling and assay must therefore be devised and regularly followed throughout the various machines. The first point to determine is the exact value of the ore as it arrives from the mine, and this can be done by sampling the crushed ore as it leaves the rolls on its way to the trommels. This may be done automatically or by hand. In the latter case the foreman can take a small box-full every half hour and put it into a receptacle provided for the purpose. From this accumulated sample the assayer can prepare his average. Samples should also be taken of the concentrate middling and tailing, and, from these data, the percentage of recovery can be figured. In this way the operation of the mill is controlled and kept up to its highest performance.

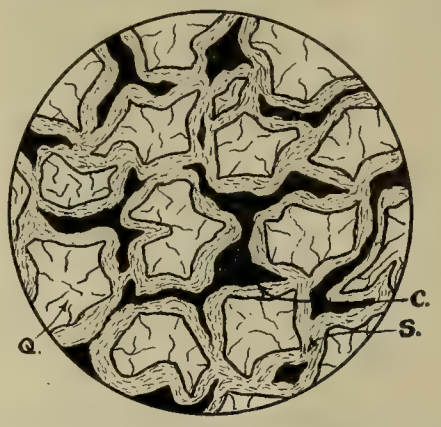
To figure the percentage of extraction we proceed as follows:

200	tons concentrating ore of 5% lead when concentrated yields	1,000 units
16.4	tons concentrate of 50% lead yields	820 "
183.6	" tailing of 0.97% " "	180 "

The degree of concentration in this case is of 200 tons into 16.4 tons or of 12 into 1. The recovery is 82%—that is, out of the 1,000 units put through the mill 820 units were recovered in the concentrate. The loss increases with the degree to which the concentration is pushed, and, in some ores, the value of the ore lost in thus bringing up the grade more than overbalances the increased market value of the higher grade concentrate which the millman is trying to make. The only way to find out at what point to stop, is actually to assay the ore and products, and to figure out from the data what degree of concentration pays best. If silver is present, as in argentiferous galena, a careful watch should be kept on the slime, in which the greatest loss of this precious metal occurs.

Copper in Quartzite.

The occurrence of copper ore in the Snowstorm mine, Shoshone county, Idaho, presents some interesting features. These deposits occur in a coarsely granular member of the Burke quartzite series of the Cœur d'Alene. The grains of quartz are sub-angular to round. They are fairly homogeneous in nature and size. The microscope shows no minerals except quartz, limonite, and the copper ore. There is no metasomatic replacement, for the cementing material is only silica. The strings of chalcocite are fairly continuous between the grains, and in nearly every instance run between the individual quartz particles—that is, that we have an infiltration, and not in any sense a replacement. The original ore was possibly deposited before the quartzite was compacted with the cementing silica. As another probability, there is no original ore present.



Q.—Quartzite. C.—Chalcocite. S.—Silicious Cement.

ALL the metallurgical operations of the ancients were entirely empirical. Nothing was known of the assaying of ores. Color and weight were the only indications of the quality of iron ore. The idea of the transmutation of metals, which formed the aim of the chemical operations of the middle ages, did not go back to classic times. Geber, in the eighth century, was the first to recognize a metal as a fusible and malleable substance. He taught that all metals consist of sulphur and quicksilver in varying proportions. Alchemy did nothing to advance the iron industry; but there were, besides the alchemists, other philosophers who cared nothing for these things. Pre-eminent among these were Theophilus, the priest and monk, and Leonardo da Vinci, the artist. The former was a German who lived in the second half of the eleventh century. He was not only an author, but also a skilled worker in metals; and his book contains, besides the usual superstitions of the age, many practical observations, and gives a good idea of the workshop practice of a mediæval metallurgist. Leonardo da Vinci, who lived 300 years later, was not only a greater painter and sculptor, but also an engineer and philosopher, with an astonishing knowledge of physics and mechanics. He developed the idea of the artesian well, and constructed deep boring plants, pumps, water-wheels, hydraulic presses, canals, and locks. He made a steam cannon, and had a dim idea of many other late inventions. His metallurgical knowledge was considerable. Among the many drawings left by him, one of a file-cutting machine is specially remarkable.

THE man of science has learnt to believe in justification, not by faith, but by verification.

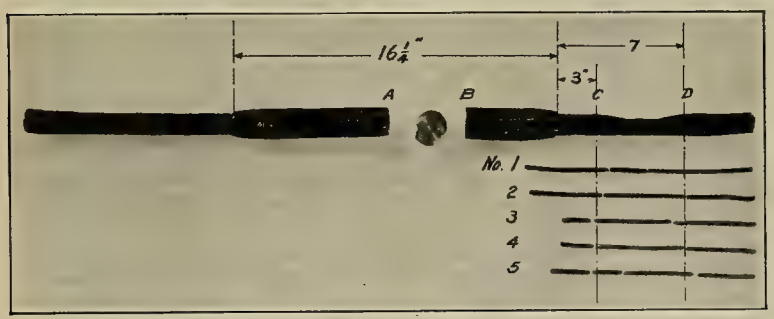
Strength of a Brazed Cable Splice.

Written for the MINING AND SCIENTIFIC PRESS
By GEORGE L. CHRISTENSEN.

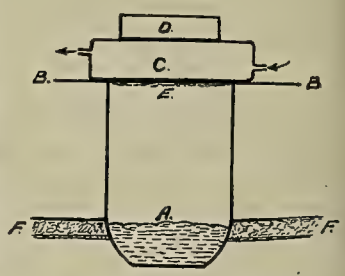
The following is the record of a tensile test of a brazed splice in a 1⅛-in. diam. 19-wire, crucible cast-steel cable used in the standing line of an aerial tramway.

According to the engineer sending in the specimen tested, the splice was made as follows: "The cable was prepared for brazing by first scraping clean the length of the braze and then cleaning further with dilute hydrochloric acid to remove all oil and grease. The sleeve, which is of boiler steel, was cleaned in like manner. Next, the cable was put in place and the sleeve closed in on it. A small portable forge was then placed under the joint and heat applied slowly and carefully. When hot, the spelter and flux were fed in until the joint was filled."

The cross-sectional area of the sleeve at section *B* is 0.82 sq. in. The total cross-sectional area of the 19 wires is 0.735 sq. in. The sleeve encircles the cable for about five-sixths of the circumference. The ends of the specimen beyond the sleeve were gripped firmly by long cast-iron blocks having semicircular grooves fitting the cable closely. These blocks were clamped by means of bolts so that all wires were held firmly. The load was applied gradually to these blocks in a 100,000-lb. testing machine. The sleeve began yielding and scaling off at section *A* under a load of 31,000 lb. and broke at the same section under a load of 39,700 pounds.



The Splice, Showing Break at A and Cross-Section Where Cut at B, Also Wires Tested Individually at C and D.



Apparatus for Determining Mercury.

After the test, five wires were cut from one end and tested individually at two points, *C* and *D*. At *C* the wires had been heated during the brazing process, while at *D* the wires were apparently normal.

STRENGTH OF INDIVIDUAL WIRES.

Wire No.	At Point *C*, lb.	At Point *D*, lb.
1	3,940	7,100
2	3,660	7,520
3	4,900	7,750
4	4,120	7,500
5	4,840	7,575
Average	4,292	7,489

Since the rope contains 19 wires, the strength of the rope at these two points would be about 19 times the average strength per wire, as indicated above, or

Strength of rope at point *D*	142,300 lb.
" " " " " *C*	81,500 "
Loss of strength due to heating	60,800 "
Loss of strength due to the heating of the wires in the brazing process	42.7%
Efficiency of splice on basis of normal strength (point *D*) of rope, $\frac{39,700}{142,300} \times 100 =$	27.9%
Efficiency of splice on basis of strength of rope at point *C* where the wires were heated, $\frac{39,700}{81,500} \times 100 =$	48.7%

Since at Section *A* the whole load was carried by the sleeve, the rope ends butting together at this point, the stress in the sleeve at breaking was 48,400 lb. per sq. in. Evidently a stronger grade of steel or a much larger cross-sectional area should have been used to bring the strength of the splice up to that of the rope at the heated section, *C*. The fracture both of the sleeve and the wires showed a rather coarse crystallization, indicating a weakness due to too high a temperature while brazing. Great care should be taken to avoid over-heating, and, if it is necessary to use a rather high temperature to flow the spelter properly, the splice should be carefully and evenly re-heated, after brazing, to a low yellow, or the color at which, when cooled and fractured, the steel shows the finest, closest 'grain.'

There was no indication of slipping of the wires in the sleeve, and hence no data was obtained as to the strength of this part of the splice.

Determining Mercury in Low-Grade Ores.

A very convenient method—based on Eschka's—of determining small quantities of mercury is illustrated by the accompanying diagram. *A* is the charge of ore mixed with iron filings, in a porcelain crucible supported by a piece of asbestos card *F*. Above this is placed a clean silver plate *B*, overlapping considerably, on which the mercury is deposited at *E*. The modification is in the water coolor *C*, made from a small round tin box to which the lid is soldered and to which two small tubes are attached as illustrated. Through these a continuous stream of cold water is allowed to pass. This is held firmly in place by weight *D*. This modification will be found a very great help for the rapid manipulation of a number of assays.

TIN PLACERS.—The first cassiterite discovered in the Carolina region occurred as loose pieces unattached to any rock in place, and during the first five years that the existence of tin was known, nothing but this float tin was found. Since the discovery of cassiterite in the rock in place, nearly all prospecting and primary development work has been guided by the occurrence of pieces of float. In a few places, as at the Ross mine and the Jones mine, the amount of cassiterite scattered through the soil has been sufficient to encourage efforts for its recovery, and a comparatively small return has been obtained. A little panning has been done in the beds and flood plains of some of the streams, but the results have not been promising. All this float or placer tin is directly traceable to the original deposits in dikes. As the rocks are decomposed and disintegrated, the cassiterite of the dikes, being very resistant to alteration, is freed from the rock and on removal of the other materials is left behind because of its high specific gravity, being in this way gradually concentrated.—L. C. Graton, U. S. Geological Survey.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Where the claimants sued in an action for trespass on the extra lateral dip of a vein having its apex within the claimants' location, it was held that the claimants were not bound to establish the identity of the vein by the actual tracing thereof from within the surface lines of their location to the point of the alleged trespass, but that the claimants were only bound to show the continuity of the vein between the apex within the lines and the point at which the alleged trespasser was mining.—Daggett *v.* Yreka Min. &c. Co., (Cal.) 86 Pac. 968.

In the location of mines prior to 1884 it was held that there must have been the discovery of a vein, and marking of a location so that its surface boundaries could be readily traced and the end lines of the surface location must have been laid off parallel to each other and at right angles to the vein.—Daggett *v.* Yreka Min. &c. Co., (Cal.) 86 Pac. 968.

Prior to the present mining laws there was no statute requiring, authorizing, or giving any definite legal effect to the posting and recording of notices or location. It resulted that the posting and recording of such notices did not in themselves constitute a location, but that they must be held to be acts which tended to show a proper marking of the surface locations, so that the boundaries of the claim could be readily traced.—Daggett *v.* Yreka Min. &c. Co., (Cal.) 86 Pac. 968.

In an action for damages and for trespass for taking ore from the plaintiff's mines it was held that the plaintiff could prove that the defendant had taken ore within the plaintiff's extra lateral rights without alleging the existence of the vein having its apex within the surface boundaries, but departing from over side lines on its downward course or that the end lines were parallel.—Daggett *v.* Yreka Min. &c. Co., (Cal.) 86 Pac. 968.

In an action to settle conflicting rights in a mining claim, it was held competent for the parties to agree that the only point to be contested was whether the complainant under his location resumed work on his claim, after forfeiture and before defendant's location.—Gibberson *v.* Wilson, (Ark.) 96 S. W. 137.

A person having an option to purchase a mine, assigned a half interest to others, in consideration that they would pay certain installments of the purchase price. The parties then formed a mining partnership to purchase and work the mine. Afterward the complainant, one of the purchasers of the option, paid the first installment, and when the second became due the purchasers all gave their joint note to one of the original vendors, and borrowed money on another joint note and paid the other vendor, it was held that though the complainant had not paid his share of the two notes, his failure to do so did not forfeit his interest in the mine.—Larsh *v.* Boyle, (Colo.) 86 Pac. Rep. 1000.

The rights of an adverse claimant to the premises in controversy are limited to those existing at the time of filing his adverse, and he will not be heard to assert a right to the disputed premises by virtue of one brought into existence thereafter, as this would be permitting him to assert title by virtue of rights other than those upon which his adverse was based.

A location without a discovery carries with it no rights, and if no adverse is filed there can be no adverse suit. The alleged rights upon which an adverse is based must be established by the evidence.—Healey *v.* Rupp, (Colo.) 86 Pac. 1015.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from Columbia, Cal., marked W. G. C., is Diorite.

The mineral from La Plata, Colo., marked W. R. P., is Feldspar, not corundum.

The specimen marked R. A. K. from Central City, Colo., is Dacite or quartz-andesite.

The mineral from Los Angeles, marked F. G., is blue and white quartz coated with Limonite.

The gray flakes in the decomposed sulphide ore from Darwin, Cal., marked A. H., are scales of Talc.

Specimens from Mascota, Jalisco, Mex., marked P. F., are: No. 1 and 2. Quartz-porphyry, not copper bearing; No. 3. Rhyolite; No. 4. Chalcopyrite, tarnished.

Rocks from E. C. B., of Buffalo, N. Y., are: No. 1. Hornblende-gneiss; No. 2. Chloritic schist; No. 3. Hornblende-schist; No. 4. Chloritized gneiss; No. 5. Pyrrhotite; No. 6. Calcite with quartz and chlorite.

The rock from Yamhill, Oregon desert, marked R. B., is an altered volcanic rock, probably Rhyolite, and is similar to some of the Nevada rocks. The brown mineral is Limonite, apparently a pseudomorph after a platy mineral like biotite.

PRECIPITATION BY ZINC-DUST. — Precipitation by means of zinc-dust was formerly practised in the cyanide plant of the Wasp No. 2 Mining Co. at Yellow Creek, S. D. The precipitation was carried on in the sump-tanks. These vats for this purpose were provided at the bottom with a perforated circular iron pipe, connected with the air-pump. The bottoms of the vats were inclined ½ in. per ft. toward the discharge pipe to insure complete drainage. When the vats had filled with gold-bearing solution the air was turned on, giving the solution a circular motion, with also ascending and descending currents. The air pressure used was 45 lb. per sq. in. Then zinc-dust was added in the form of an emulsion around the edge of the vat and the contents of the vat agitated by air for ten minutes. Then the material was pumped through the filter-press, leaving some of the zinc-dust and precipitate in the bottom. The amount of zinc-dust used, to start with, was one pound per ton of solution. This was gradually reduced to ½ lb. for the strong solutions and ¼ lb. for the weak solutions in succeeding precipitations. It took two hours to pump 12 tons of solution (the amount usually precipitated) through the filter-press. The tailing solution from the filter-press usually had a value of about 10c. per ton, showing that the precipitation was good. The objections to the method arose in treating the precipitate taken from the presses. This usually packed very hard, so that it was difficult to disintegrate it for the acid treatment. It was found that the dilute sulphuric acid would attack the dust precipitate but very slightly, it being practically impossible to get the zinc out. This fact may be due to the coating of metallic gold on the zinc particles, protecting them from the acid. At the Golden Gate mill in Utah and in several other plants where the process is in use, a mixture of sulphuric and nitric acids is used, seemingly with success. Finally the acid treatment was discarded and the zinc precipitate was roasted and then smelted. The usual zinc-thread precipitation then replaced the zinc-dust method.—*Bulletin* No. 5 South Dakota School of Mines.

An African Conveyor System.

The cyanide process, whereby gold is primarily dissolved from its matrix of quartz, as found in lodes, consists of vats for chemically treating the whole mined product and means whereby the residuum is ejected after chemical separation of the gold. Where this process is carried on to the extent of hundreds of tons of material per day many vats of large dimensions are required, combined with conveying machinery whereby the raw material is not only taken to the vats, but the residuum of sand is also carried to waste places to accumulate in piles of great magnitude. This statement applies particularly to the goldfields of South Africa, where the cyanide process is much used, and especially to the largest known plant of its kind, namely, the recently built joint mill of the Knights Deep, Ltd. and Simmer & Jack East, Ltd. companies.

In the combining of these two plants much re-arrangement of old material and the addition of new conveyors were made necessary. The conveyors were furnished by the Jeffrey Mfg. Co., of Columbus, Ohio, and in no place has the belt-conveyor shown better its ability to handle gritty and heavy material and for carrying it to a great distance. In the joint plant, a space 170 by 470 ft. is occupied by 40 vats, each 40 ft. diam. by 9 ft. deep, arranged in four rows of ten vats each, known as 'treatment tanks.' Over these are situated 16 similar vats known as 'collecting tanks,' which are placed concentric with 'treatment tanks' No. 4, 5, 6, and 7 of each row. Over the 'treatment tanks' and below the 'collecting tanks' there are four 20-in. rubber belt-conveyors, one over each row, driven by separate motors. These conveyors distribute the material from vats above to those below, as material is ready to be treated.



Conveyor at the Knights' Deep Mine, Johannesburg.

Beneath each of the four rows of treatment vats, and directly under the four conveyors above mentioned, there are four 20-in. rubber belt-conveyors each 426-ft. centres, running over three pulley troughing idlers, 4-ft. centres. These conveyors are fed with the residuum of sand and work through a small opening in the centre of the bottom of each vat; they carry the sand to one end of the rows of vats, delivering it to two cross-belt conveyors at right angles to ends of the first four conveyors. These cross-conveyors face each other, the first carrying the refuse from the first and second of the vat conveyors to the head of the third vat conveyors, while the second cross-conveyor takes the fourth vat conveyor material to the same point, thus concentrating all the refuse at one point. The refuse being thus collected from the treatment vats at one point and on one level, it is then delivered to a 30-in. rubber-belt conveyor, which, in carrying the refuse on 310-ft. centres, elevates it 20 ft. into a 50-h.p. motor-house at the head of the conveyor and at the edge of the dumping ground, as shown in the accompanying illustration.

At this point the material is delivered to the eighth and longest belt of the system, a 30-in. 6-ply 3/16-in. rubber-covered Century belt 430-ft. centres, which carries the refuse to the top of the dump, as shown in illustration, a difference of elevation of 122 ft. from the first four conveyors under the vats. Having reached the top of the dump, the sand is delivered to the ninth conveyor of the same make as the incline conveyor, except that it is now but 125 ft. on centres and is built on a horizontal portable wood frame, thus making it possible—by the gradual shifting of this frame, in the extension of the conveyor head from the incline conveyor, besides the moving of it in an almost complete circle about the head of incline conveyor—to build gradually a plateau from the top of the original pile. As the work of moving this portable conveyor is too cumbersome a work to perform daily, there is placed at the head of this last conveyor what is known as a distributing boom of two 36-in. belt-conveyors, all self-contained within a portable steel frame. The first of these is merely a 30-ft. extension of the last conveyor, shown in the upper left-hand corner of the illustration, while the second conveyor of the boom on 56-ft. centres is placed in boom at right angles to and back of the advance belt. This last boom conveyor is on rollers in the steel frame, so that it can distribute material 56 ft. to either the right or left, being fed through a three-way hopper capable of placing material to advance belt or to right or left on cross-belt. In time it is intended to extend the ninth conveyor, feeding boom, from 125 to 450-ft. centres. Thus it can be seen that with the present dump-conveyor system, a plateau an eighth of a mile in diameter and 120 ft. high may be built before it will become necessary to change the present system.

Commercial Paragraphs.

FRANK S. CRONK is with Cary & Fielding, at Denver.

A. H. SEEP, vice-president of the Mine & Smelter Supply Co., has returned to Denver from Mexico City.

ERNEST GAYFORD, with the Utah Mining Machinery & Supply Co., has returned to Salt Lake City from a trip to Mexico.

THE LINK-BELT CO. has recently opened an office at No. 913 Missouri Trust Bdg., St. Louis. E. C. Berghoeffer, an engineer of long experience with the Chicago house of the company, is in charge.

THE COMPRESSED AIR MACHINERY CO., of San Francisco, reports that, notwithstanding the disaster of last April, it has manufactured and sold 22 air-compressors and 8 Word Bros. drill-sharpeners since completing its new shops.

THE HEWITT MACHINERY CO., 503 Monadnock Bdg., San Francisco, announces that it has been appointed representative of the Atlas Engine Works, of Indianapolis, Indiana, and carries a complete line of engines and boilers for hoisting and power service.

THE HUG WATER WHEEL CO. of Denver, recently shipped two 5-ft. double-nozzle water-wheels to the Basin Reduction Co., Basin, Mont.; one 6-ft. wheel to Utah; one small wheel to the Midas Mining Co. for the Penrose mine, Leadville, and one to the Pikes Peak railroad, at Colorado Springs.

Trade Treatises.

THE JOHN A. TRAYLOR M. CO. describes the Imperial ore screen in Bulletin E, which has been recently published.

THE B. V. STURTEVANT CO. has issued a pamphlet illustrating its steel pressure blowers in an interesting and instructive way.

The tenth edition of *Graphite as a Lubricant*, published by the Joseph Dixon Crucible Co., is a useful contribution on the subject of lubricants and gives trustworthy information on modern practice in graphite lubrication.

REAVELL CO., LTD., of Ipswich, has published a pamphlet on its patent air-compressors. These present many new features, consisting of four cylinders arranged radially in a circular casing. The compressor has no suction valves and is very convenient where portability or compactness are important

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Editorial.

IT IS ANNOUNCED that the legislature of the Province of Ontario proposes to raise a direct revenue from the mining industry, by levying a royalty on the output. This is aimed chiefly at the Cobalt mining companies, now largely controlled by Americans. The proposal is likely to be opposed by the large financial interests involved and, if the legislature is like most bodies of the kind, persuasion is likely to prevail. The press of Ontario is insisting that the ores of the Province be smelted locally, so that the American reduction works shall not gather the profits of that operation. It is a short-sighted policy. If it pays to smelt the ore in Ontario, some one will do it. Attempts to regulate these questions by legislation are childish.

OUR London letter, as usual, is full of interest. This week there is an account of the big financial operations involved in the development of copper mines near Lake Tanganyika in central Africa. The enterprise is on an enormous scale, and the forecast of its energetic promoters is fully in keeping with the splendid optimism that has dared to lay the foundations of an important copper industry in a region only recently penetrated by civilized man. Among the engineers connected with the undertaking there is at least one who hails from our West, and for this reason, among others, we hope the expectations of these builders of empire may be reasonably fulfilled. Another portion of our London letter refers to the reawakening in Cornwall, and it is fitting enough that one who has done such credit to the Cornish name and led the way so effectively in the development of Colorado, should be the spokesman for the 'old county.' Mr. Richard Pearce's observations will be appreciated by his numerous friends on this side.

MINING COMPANIES are often organized under the laws of States other than those in which they do their business and in this way, as permitting of the evasion of honorable obligation, the States of New Jersey, West Virginia, and the Territory of Arizona are particularly favored by promoters. In London they go to Guernsey, in the Channel Islands, in order to escape certain regulations of the Companies Acts. These practices are open to criticism from the point of good citizenship, but they are thrown in the shade by the recent departure of the Tanganyika Concessions Ltd. which has been registered under the laws of the Congo Free State. New Jersey is destined to take second place as a promoter's haven; when you want to dodge onerous obligations, register your company in the jungle. No wonder that *The Investor's Guardian* makes a protest. Is it that the King of the Belgians wants additional sources of revenue?

IN THESE DAYS even respectable newspapers flaunt full-page advertisements of mining stocks. To give an air of financial importance to this peddling of chances, it is the growing practice to employ the medium of Securities Corporations, Trust Companies, and Banks — many of them in capitals as large as their real capital is small. Mushroom mining camps nowadays boast financial institutions with imposing names, and it is easy to understand that the farmers in Iowa, the clerks at New York, and the cooks in Maine do not appreciate the fact that such high-sounding fiduciary organizations may be brokerage concerns and promotion syndicates of an ephemeral kind. There is a look of comic opera about many of the prospectuses advertised; some of this may develop into sordid tragedy, for it is obvious that untried prospects are being floated as mines on the strength of the wonderful riches of the new goldfields in Nevada. Our readers do not indulge in this form of gambling, they prefer the saner kind, where the deal is from the top of the pack; so we need not admonish them. But for the sake of decent mining, we hope they will keep as many of their friends as possible from throwing away their money. The opportunities for sane speculation in mining are numerous enough without indulging in a blind gamble.

Only recently the stock of the Bullfrog Rush Mining Company was offered on the basis that there was $6,000,000 worth of ore blocked out. Shortly thereafter three of the gentlemen on the directorate resigned and published an advertisement, stating their reason for so doing, which was, that although the property is "a splendid prospect" it has been ascertained that "the best average assays obtained in the lower workings are from 60 cents to $1 per ton." Underneath this advertisement appeared another from the trust company that had sold the stock, offering to take back the shares—and pay for them? Not at all, only permitting shareholders who had been misled by suppositious ore reserves to select from any of the company's "new promotions." We notice that the Governor of Nevada, just re-elected, is a director of this and other companies. It is a mistake for governors to figure on the prospectuses of stock companies; it leads to complications. They pledge the credit of the State to speculative enterprises concerning which their judgment is fallible. Governors are not necessarily good judges of mines.

Who Is a Mining Engineer?

This discussion is now closed. It has served its purpose. The question has been answered. It is true that one reader objected to the ventilation of the subject and spoke of it as a "miserable hollow discussion," and another in a more humorous mood sent a message across the continent, saying:

"Il y a des hommes qui se font Espagnol
Qui ne sont pas de tout Espagnol"

Which might be interpreted as meaning that there are 'false alarms' in every walk of life. However, we do not apologize for giving our columns to the debate. It has fulfilled a purpose, namely, to crystallize current notions. We recognize now that a mining engineer is one who performs the duties of a mining engineer. What are those duties? Before defining them, it will be well to summarize the views expressed by our correspondents.

Among those who have contributed are scientific men, superintendents of mines, journalists, and investors. In a multitude of councilors there is wisdom. Let us give precedence to the scientific view; naturally, it begins with a precise definition. Mr. George J. Bancroft quotes the dictionary and says a mining engineer is one who is "skilled in the principles and practice of all the operations of mining." But if he does not apply those principles to actual operations, he remains only a possibility. He must demonstrate the possession of certain abilities. Therefore we agree with Mr. Walter E. Koch that, although a man may graduate from an engineering college, the passing of his examinations does not make him an engineer; emphatically, he must do things, he must have put his training into practice. This is in opposition to those who think, with Mr. Algernon Del Mar, that "a mining engineer is one who takes a diploma from an institution making a specialty of mine engineering." The mining engineer is essentially a worker; by his deeds you shall know him, and not by his credentials of instruction nor by scientific attainments that have yet to be put to the test. Such evidently is the view of that experienced employer of engineering talent whose identity is hidden under the signature of 'A London Investor.' To him the test is whether a man "does good honest work in the direction of mining enterprises," for whether he examines, manages, or plans the operations around a mine, his work is a contribution toward the "direction" of the enterprise. We agree with this contributor in deprecating the idea that mere titles indicate practical proficiency. The alphabetical appendage or the luminous tail has ceased to be impressive. A man who is a F. G. S., F. R. G. S., even A. I. M. E. or M. E., may be an inexperienced duffer or a tender fledgling, no more an engineer than a draughtsman is an architect.

It is pleasant to notice that many of the contributors, like Mr. G. C. Hewett and Mr. E. Rammelmeyer, acknowledge that the graduation certificate does not make men doctors, lawyers, or mining engineers. The days of their own apprenticeship are far enough behind to give them a broader outlook and to enable them to appreciate that "duty well done, with honesty of purpose" often characterizes men lacking an academic training. There is no "exclusive set." In America, the land of all others where professional men are granted complete freedom of opportunity, there are many who have risen to a distinguished position without college training. We number among our friends several in the foremost rank of the profession that never graduated from any college; they are men of fine judgment, wide experience, broad knowledge, and they are the first to confess that they regret to have missed the preliminary training—which they are giving their sons. Men may become skillful engineers without academic preparation, but it is quite certain that they achieve their fitness more laboriously, less directly, and much less frequently than if they had received the impetus of a special training in early youth.

So here's a hand to that type of American manhood, the mining engineer who has achieved efficiency despite every obstacle. All honor to him!

Some of the volunteers in the profession have paid their compliments to the regulars. Mr. George Huston, as a newspaper man, states that 90% of the failures in mining in his part of the world are due to college men. That is an unscientific statement; it is probable that 95% of the operations were directed by college men and, in any event, not 10% of the mines that start are ever successful. He inveighs against the globe-trotting fellow who, possessing a superficial knowledge of many places, undertakes to unravel the geological structure of a district almost at a glance. In this he is right; such quacks are extremely dangerous. They are not engineers, because they do not do things. They talk about them.

With some of our correspondents we cheerfully disagree; as, for instance, with those who consider that journalism is a good preparation for mining engineering. As a journalist himself, the writer does not hesitate to say that the describing of things, even the "sifting machine" of keen observation, does not make a man a mining engineer or go far toward preparing him for such an occupation. The fatal facility of the scribe is dangerous. So is the enthusiasm of the purely scientific mind. Scientists and journalists in mining are not engineers. They do not do things. They write about them, they forecast them, they explain them. They do not perform the duties of a mining engineer.

And thus we come to the letter of Mr. E. E. Wann, which we publish as representative of those who delight to jibe at the 'big guns,' the 'exclusive set,' the 'inner guild,' and so forth. It is all bunkum. So is the tiresome contrast between 'practical men' and 'college men' where 'practical' stands for the ignorant, lazy, or unsuccessful, and 'college men' for presumptious boys, inexperienced youths, mere book-worms, enthusiasts from the library, and the like. It is experience and intelligence that count, mere experience—simply to have lived, seen, and suffered hard knocks—does not suffice, unless intelligent use has been made of it all. To anyone irritated by the success of the well-trained energetic men who dominate the profession, such a personage as Marcus Daly may possibly stand for a type of the mining engineer, but to no one else. He was a miner and mine operator, an enterprising ignorant man who was pitchforked by accident into a prominent position. As to comparing his "achievements" with that of a "mining engineer of the college type," these columns can be better employed. To the uneducated it may be a satisfaction to suppose that Daly "hired" those whose knowledge he lacked, but it is a fact that he had such abysmal ignorance as to say that he had no use for technical men. Herein he failed in his duty, for it is required of a mine manager that he shall employ all the appliances conducive to good work, and of these none is so effective as science. Yet we do not deny to Mr. Wann the right to label Marcus Daly a mining engineer; he was in charge of mines and he directed their operations, therefore he was a mining engineer—but a bad one. And so we agree heartily with Mr. William Magenau that the type of man we are trying to label cannot be "a paragon of ability and rectitude"; there are mining engineers and mining engineers. All the efforts of institutes and professional associations have failed to pick the sheep from the goats. Such a criminal as Whitaker Wright was a member of the American Institute of Mining Engineers when he committed suicide, and today a member of the more exclusive Institution of Mining & Metallurgy is dodging extradition laws on the Riviera in consequence of flagrant wrong-doing in connection with a copper mine in California. The trouble is that a man may be a fit and proper sort of mining engineer in 1896 and wholly unfit for decent professional association in 1906. On the other hand, a fellow who falls by the wayside in 1896 may have pulled himself together and be a responsible man ten years later. The personal equation remains yet the great insoluble theorem in human mathematics.

Far different is the spirit of Mr. Edward W. Ralph's letter; as a journalist and a miner, he pleads for a chance to make good—for himself and for others who did not ride into the profession on a coach and four. He can thank his stars that he lives in a country where the only test is fitness, for whether he graduates from the stope or from the library, he will have an opportunity to learn mining engineering. It will be harder work and it will take longer than for the young man from the Columbia School of Mines, but earnest purpose will count. There is plenty of room for such men.

Thus, finally, we come to the question: What are the duties of a mining engineer? Mr. G. W. Miller says, properly enough, that his functions are often held to include requirements foreign to mining. Nor can he be intimately versed in all of them. The field has become so wide, that he must have a general knowledge, one or two specialties, and in addition he should possess that invaluable gift—good sense enough to know what he does not know. It is useless to expect walking encyclopedias to run mines or peripatetic reference libraries to superintend smelters. This much it is safe to say, that men who have never managed a mine are rarely qualified to examine them for purchase, that superintendents who have investigated several mines are more likely to direct their own operations well, that those who have passed through such subordinate positions as assayer, surveyor, and underground superintendent have received a good preparation to become general managers. But none of these are rules; men have a magnificent way of breaking precedent, especially in a land where supreme capacity need bow to no fetish. The obvious duties of a mining engineer are to superintend operations, to plan the work of a mine, to choose, erect, and apply machinery, to sample and examine properties in order to appraise them, *to make a mine out of a hole in the ground.* Therefore those who write about mines, those who talk about them, those who visit them, those who finance them, those who buy and sell them, those who speculate in them, are not mining engineers; and whenever a mining engineer ceases to perform the duties of his profession and devotes himself to those of the promoter, financier, speculator, journalist, or farmer, he ceases to be a mining engineer. He is a shoemaker who sticks to his last.

Special Correspondence.

Butte, Montana.

Scarcity of Labor.—Raise in Wages.—Increased Production and Enlarged Smelter Capacity.—Boston & Montana Working Rich Ore.—Favorable Developments in Depth in Amalgamated Mines.—Butte Coalition Preparing for Bigger Output.—Exploring the Alice Group.—Calumet & Belinda.—Clark's Mines in Poor Zone.—Butte Central Cuts New Lode.—General Activity.

The scarcity of labor in Butte has greatly retarded production of copper during the past few months, and the condition has been getting worse. It is expected that the increase of wages of underground men from $3.50 to $3.75 per day, voluntarily made by all of the big companies, led by the Amalgamated, will assist in improving labor conditions. The increase means an added expenditure for wages on the part of the big companies of not less than $1,000,000 per year. The daily output of the Butte district at present is about 13,500 tons of ore, but the quantity fluctuates very much. The Boston & Montana, one of the Amalgamated companies, is producing about 3,500 tons per day, and is planning to increase the amount by the first of December by 500 tons. The increased production will be shipped to the Washoe smelter at Anaconda for treatment, because the Great Falls smelter of the Boston & Montana is taxed to its utmost capacity at present, as it handles all of the Boston & Montana ore and some of the ore from the mines of the Butte Coalition Co. The 500 tons increase will come from the West Colusa mine, which has been shut down for some time while improvements were being made. With the completion of improvements at the Great Falls smelter, which are now under way, that plant will be able to handle 1,500 tons per day more than it is handling now, and the Boston & Montana Co. expects to contribute about 700 tons to that increased consumption. The smelter improvements will probably be completed in 6 to 10 months. The Boston & Montana is mining an unusually high grade of ore at present, the average yield of copper being about 5% for the first and second-class ore. The ore from the Leonard mine assays 5½ to 6%. The bottom levels of all the mines are looking better than ever. The company is mining from five shafts—the Leonard, Mountain View, West Colusa, East Colusa, and Pennsylvania—and is sinking two new shafts on the Greenleaf and Badger State. The Leonard shaft is 1,200 ft. deep, but there are workings below that point, from adjoining claims, and a raise is being made from a depth of 1,400 ft. to connect with the shaft. The Pennsylvania is 1,845 ft. deep, the West Colusa 1,600, the East Colusa 900, the Mountain View 1,800, and the Greenleaf 550. Work on the Badger State shaft has just begun and the shaft will be made 2,000 ft. deep.

Other Amalgamated companies are as active as the Boston & Montana, and a great amount of development work is being done. The deeper the mines are opened the bigger the veins are found. So far the deepest point from which ore is extracted in the Butte district is 2,400 ft. The shafts of the High Ore and the Never Sweat, both Anaconda mines, are more than 2,500 ft. deep, but the veins have not been cross-cut below the 2,400-ft. level. Sinking is going on in both shafts and no cross-cutting will be done until 2,600 ft. is reached. The Anaconda Co. is mining from its mines about 3,600 tons of ore daily, and a semi-official statement is that the ore assays 4½% copper on an average. The shaft of the Anaconda mine is 2,450 ft. deep, and will also be sunk to a depth of 2,600 ft., but work on sinking has been stopped while raises are being made from the 2,400 and 2,200 levels, and until the mine is ready to handle the water in the shaft and that coming from the 2,400 cross-cut. The vein has been cut at 2,400 ft. and is as wide and fully as rich there as it is on the 2,200, carrying a big quantity of copper glance. The cross-cut is being continued southward and has reached a distance of about 2,000 ft. from the shaft. It is understood that this cross-cut will connect with the Belmont shaft, in the southern part of the city, and that the Belmont will ultimately be made the main working shaft for the Anaconda mine.

The mines of the Butte Coalition Co. are being put in condition for a big production, and it is predicted that within a year the Coalition will be hoisting 3,000 to 4,000 tons of ore per day. When the new company took over the mines from the United Copper they were in a bad condition, showing evidence of the fact that during the last few months of possession by that company the mines were worked with the evident object of getting out as much first-class ore as possible before the properties were turned over to the new owners. The necessity of getting the mines in proper order curtailed the production, and it fell from about 1,600 tons per day to 900, but has again been increased to 1,200 tons. In the opinion of mining men Butte Coalition will, within a year or 18 months, equal North Butte in production, average value of ore, and ore reserves. The company is beginning to reap the benefit of the liberal share it received in the division of the orebodies that were in dispute between the United Copper and Amalgamated companies. Mining has been resumed on a vein, known as No. 3 of the Pennsylvania, but lying south of that property and under a number of city lots, and the richest copper glance mined in the Butte district is being hoisted from it. There is from three to five feet of ore that assays from 60 to 90% copper, and the remainder of the vein, about 9 to 10 ft., averages 10%. The vein is being mined on the 900, 1,000, and 1,400-ft. levels, and is being opened to a depth of 1,800 ft. The Boston & Montana, under the terms of division, gets 62% of the value of the ore mined from the the vein, and the Coalition gets 38. The Boston & Montana Co. has run a drift from its 1,400-ft. level of the Leonard into the Minnie Healey of the Butte Coalition and opened a fine body of ore there. In cleaning up the Rarus and exploring that property several big orebodies were opened. The Corra, which was another property that was mined only for ore for several months before Coalition got possession of it, has also been developed into a good mine again. The Butte Coalition also owns the Alice group of mines, which is expected to become one of the most important assets of the Coalition.

La France Copper Co., owned by United Copper, has succeeded in unwatering the Lexington mines, and, in doing it, also unwatered the Alice mines above the 650-ft. point, where the workings of the two properties are connected by a cross-cut. The company will immediately begin work on the lower levels of the mine and expects to increase the daily output to about 400 tons within a few weeks. The output at present is 150 to 200 tons. The Lexington ore assays high in silver and also carries good copper values.

The shafts of the Calumet and Belinda of the Butte & Bacorn Co. have reached a depth of 500 ft. and cross-cuts will be run to the veins as soon as stations are cut. The shaft of the Colleen Bawn is but 330 ft. deep, the work on that shaft having been slow owing to bad ground. A cross-cut north and south will also be run from the 300-ft. point. There is a vein within 100 ft. of the shaft.

The mines of the Original Mining Co. owned by W. A. Clark, have entered the lean zone in which the Anaconda spent so much unprofitable time and through

which the Parrot is now working. The Clark ore now being shipped is very low grade. The output has also been curtailed by an extensive cave in the West Stewart mine, and for several weeks the company has been averaging less than 500 tons of ore daily. The Clark mines for a year or more have varied more than any other property in the Butte district in daily output of ore and monthly production of copper. The old rumor that the Amalgamated Co. is likely to absorb the Clark mines in Butte has been revived.

The Butte Central & Boston Copper corporation has cut into the south vein in the Ophir mine at a depth of 500 ft., but the heavy flow of water forced a suspension of operations and it will not be resumed for several days, or until the vein is drained. It was cut 270 ft. from the shaft, but the value of the vein will not be known until penetrated by the cross-cut. The company is driving on another vein at the 500-ft. level and some silver ore of good value is being taken out. Some bodies of high-grade silver-gold ore have been opened on the 200 and 300 levels. Some streaks assay as high as 500 oz. of silver and $25 in gold per ton, and 7% copper, but such streaks are small. The company has received its new hoisting engine, which will shortly be placed in position. As soon as it is in running order, sinking will be resumed and continued to a depth of 1,000 ft. The country below will then be cross-cut, in the expectation of finding copper. There are three known veins in the ground, but it will be a long time before it will be determined whether they are valuable.

The Butte-New York Copper Co., which has practically succeeded the Butte-Milwaukee in the ownership of the Pollock group of mines by the purchase of a controlling stock interest in the latter, will sink a new shaft on its property. The company has so far very little to sustain the high valuation placed on its stock in New York, but its property is favorably located.

Leadville, Colorado.

The Yak Tunnel Adds an Electrical Equipment. — The Resurrection to be Resurrected. — The Adams Mill. — Down-Town Geology. — Important Discovery in the Crown Point. — Development in the Catawba.—The Golden Eagle Makes Large Shipments.

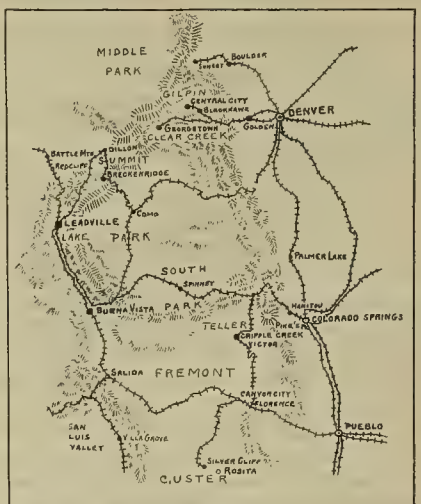
The Yak Tunnel Co. has the construction work on its new electric plant well under way. The plant is being erected near the portal of the adit, and will furnish lights for the city in compliance with a franchise recently granted. Contemporaneously with this demand come requests from various mining companies for power, as evidence of the popularity of electricity among Leadville operators. Many of the best managed properties in the district have either installed or contemplate the introduction of electric hoists. Over 60,000 ft. of transmission has been ordered by the Yak Co., and in addition to several electric hoists, the company has in continuous operation two electric diamond-drills for prospecting work. The Yak Co. has recently closed a deal with D. H. Moffat for several years' lease on the Resurrection property in Big Evans gulch, and it will ultimately extend the adit to that property. The Resurrection embraces a total of 160 acres, and has been long on the list of the camp's large producers of both high and low-grade ores, but the big influx of water caused the mine to close down until tunnel connections could be made.

Tunnel rights have been granted by the Sentry and Morning Glory mines to the Yak Co., and a latteral will be run at an early date.

The machinery on the Burdette property is to be removed to the St. Louis, and a substantial mill will be erected to treat the output from the St. Louis. —— The Adams mill, recently completed, is a substantial addition to the milling facilities of the camp. This plant includes two Blake crushers, six 5-ft. Huntingtons, 19 Wilfley and six Card concentrating tables. The Card tables treat the slime or finer product and the Wilfleys the coarse. Sizers of the ordinary cone type receive the pulp direct from the Huntingtons and classify the pulp into two products for the tables. Five-foot cones settle the slime and deliver a thick pulp to the slime-tables, there being one settler for each machine. —— The lessees on the Elva Elma have lately completed the installation of a modern hoisting and compressor plant. Development work is being rapidly extended into virgin ground and, judging from past records of this mine, we may expect it soon again to enter the list of producers.—— The French Mining Co., in the Holy Cross district, has its big cyanide mill in successful operation, and the extraction is reported by the management as being excellent.

The progress now being made by the Home Extension Co. in the way of drifts and diamond-drill work will add materially to our stock of knowledge of the down-town district. The evidence so far furnished goes to prove that the faulting disclosed by the Penrose shaft was of greater magnitude than anticipated, and that the throw of the strata is to the west. This means greater depth for shafts in the Home Extension Co. and adjacent properties before they reach the ore horizon.

The Gem Mining Co., organized to prospect the old Crown Point and adjacent properties on Rock Hill, has opened what appears at this writing to be a body of iron-



A Part of Colorado.

silver ore 30 ft. thick and of unknown length. At last this company has been rewarded for more than two years' extensive development work. They have reached the extension of the ore-shoots worked in former times to the southwest. This part of Rock Hill has been one of the most productive in the Leadville district. —— The Catawba, on Canterbury hill, has opened up a shoot of ore and a trial shipment is being made. Much interest is being manifested in this discovery, because of its magnitude, and as it is the first property to receive substantial development on this hill. —— The Golden Eagle property is rapidly improving. During the last two months it has shipped from 11,000 to 14,000 tons of ore, which the management reports to be of an excellent grade. Recent developments have led to an arrangement with the Yak Tunnel Co., whereby a lateral will

be driven to the property to drain it and facilitate shipment of their ore.

The U. S. Circuit Court of Appeals has set aside the decree of the local court in the case of N. A. Munn, and others against the Ibex Mining Co., which owns the Little Johnny mine. In the Colorado court the plaintiffs were awarded $193,448 damages, but this is now reversed by the higher court, the mining company being compelled to pay the costs only. The suit arose from the overlapping of claims located when the ground was first taken up in 1878 and 1879. The mine became highly productive about twelve years ago.

Salt Lake City, Utah.

Local Business.—Decision Against the Smelters.—Serious Position.—Possible Removal of Smelting Plants.—News From Bingham.—Tintic Dividends and Production.—Another Railroad.—Enlargement of Cactus Mill.—Important Discovery in the Daly-West Mine.

The ore and bullion settlements during the past week amounted to $943,200, while during the same period there were sold on the floor of the Salt Lake Stock & Mining Exchange 360,523 shares of stocks for which $312,061 was paid.

The smelter situation as it applies to the Salt Lake valley is serious at the present time, yet the business interests of Salt Lake are inclined to look at the future optimistically. However, the chances are very much against a continuance of the smelting industry on the site of the present plants. The injunction granted recently by Judge Marshall, of the Federal Court, against the American Smelting & Refining, United States Smelting, Bingham Con., and Utah Con., companies was a severe blow and the smelter managers almost to a man are inclined to the belief that Judge Marshall will be sustained in the Circuit Court of Appeals, where the smelter smoke cases are to be taken for final disposition. The court's decree is more sweeping than was first supposed for the reason that it restrains each of the defendants from operating their respective smelters with charges containing more than 10% sulphur as well as prohibiting them from running on ore or combination of ores containing arsenic. If the higher court concurs, it simply means that the defendants will be forced out of the business of smelting sulphide copper and lead ores; which would be the equivalent of ceasing business altogether, unless some process of roasting the ores were applied before being shipped to the smelter. However, that would be out of the question. It is more probable that new sites will be sought. The Utah Consolidated will probably build a plant somewhere within the Bingham district, where it can deliver its ore direct from the mine by aerial tramway. The Bingham Consolidated may go to a point near its Dalton & Lark mine in the lower part of Bingham; but what the United States Co. will do, can only be conjectured. The American Smelting & Refining Co. may have to abandon Murray altogether and centre its operations at Garfield, where the possibility of serious damage to growing vegetation is remote.——Two reverberatory furnaces have been blown in at the new Garfield smelter and the plant is now treating about 500 tons of ore per day.

The New England Gold & Copper Co., of Bingham, is working its mill with two shifts and turning out a high-grade concentrate to the amount of about 500 tons per month.——The Utah Development Co., owner of the New Red Wing mine, also at Bingham, is forwarding ore to a custom mill in camp, pending the construction of the plant of the Markham Gulch Milling Co.——Official announcement is still lacking, but there appears to be little doubt about F. Augustus Heinze having closed a deal for the acquisition of a control of the stock of the Ohio Copper Co., at Bingham.

Shareholders of the Lower Mammoth Mining Co., operating in the Tintic district, have authorized a bond issue of $40,000, the bonds to bear interest at the rate of 8% per annum, which are convertible into new stock of the company at the rate of $1 per share within one year. With the new stock issued, the company will have a total capitalization of 190,000 shares. It is the intention to sink the shaft to the 1,700-ft. level and explore for ore-bodies known to exist at that depth.——Three Tintic mining companies have posted dividends for November, namely: Beck Tunnel Con., $40,000; Grand Central, $15,000; Victoria, $10,000. Owing to having completed the purchase of more property, the Mammoth Mining Co. will pass this month's distribution. Shipments of ore to Salt Lake smelters from Tintic mines last week amounted to 138 carloads, the contributing mines and amounts being: Ajax, 4; Beck Tunnel Con., 9; Bullion Beck, 6; Carisa, 8; Centennial Eureka, 48; Eagle & Blue



Utah.

Bell, 7; Eureka Hill, 2; Gemini, 7; Godiva, 2; Grand Central, 3; May Day, 3; Mammoth, 10; Scranton, 6; South Swansea, 1; Uncle Sam, 2; Victoria, 6; Yankee Con., 4; Tintic Iron, 9.——The Ajax Mining Co., of which Thomas Weir of Salt Lake is manager, has liquidated its indebtedness.

That the San Pedro, Los Angeles & Salt Lake Railroad Co. intends to reach Ely, Nevada, is evidenced by the fact that surveys have been completed to a point near Fish Springs in the Deep Creek mining district and a map of the proposed route has been filed in the Federal land-office. The road will leave the main line of the Salt Lake Route at Tintic Junction and go westward from that point. It is said that construction will begin within the next 60 days with a view to heading off the Western Pacific from entering this western Utah and eastern Nevada territory.——The organization of the McDonald Ely Copper Mining Co. has been perfected in Salt Lake with Thomas Kearns, David Kieth, and E. A. Wall as the principal shareholders. The basis is the Robust, Maceo, and McDonald groups of claims covering about 4,000 ft. of the characteristic mineral zone of the camp on the north side of Robinson cañon; also 1,300 acres of land

with water rights located about eight miles south of Ely, which has been acquired for mill and smelter-site purposes.

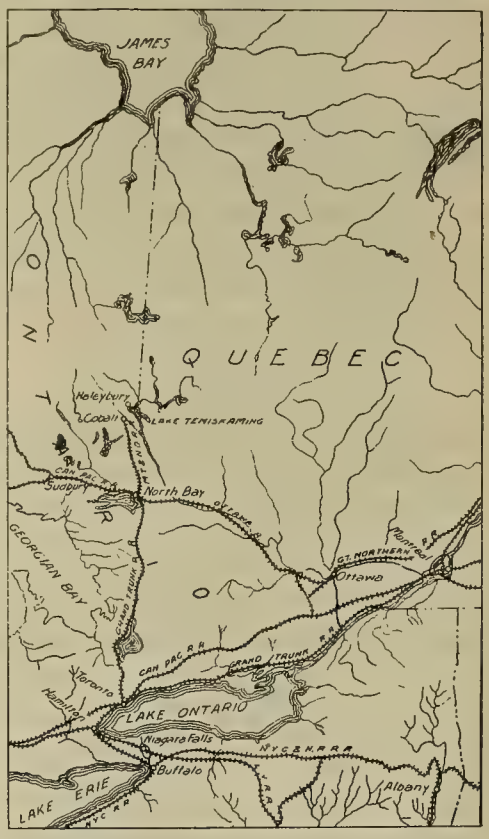
The Cactus mill of the Newhouse company in Beaver county is turning out about 100 tons of high-grade concentrate daily. The plant has been treating in the past from 600 to 800 tons of ore daily. New equipment is being installed to increase the capacity to 1,200 tons. Two electric hoists are being installed on the 600-ft. level, one of them to be used in sinking on the new orebody. The forty new cottages ordered by Mr. Samuel Newhouse are under construction.——By far the most important developments of the year in the Daly-West mine at Park City is the orebody disclosed on the 1,200-ft. level near the side-lines of the Daly Mining Co. The ore is high grade, running about 100 oz. silver and 20% lead. The vein is about 10 ft. wide; a raise has been run for 100 ft., while a second one has been started.—— Jesse Knight, of Provo, has bought the property of the Mammoth Consolidated Mining Co., in the Snake Creek district. It will become an asset of the Mountain Lake Mining & Milling Company.

Toronto, Canada.

An Important Decision in the O'Brien Case.—News From Cobalt.—Scarcity of Labor.—Several Important Sales.—New Discoveries.—Another Vein in the Grace Mine.—Smelter Building Near North Bay.—The Laurentian to be Operated by Company.—Rush to Placers in Saskatchewan.—New Process.

An important decision has been made by the Ontario Government in the case of the O'Brien mines, a rich Cobalt property of some 140 acres, situated in the immediate neighborhood of the noted La Rose mine, and estimated as being worth at least $10,000,000. For the last seventeen months it has been in litigation, the Provincial Attorney General having brought an action against the syndicate controlling it, comprising Michael J. O'Brien, James B. O'Brien, Arthur Ferland, and others, to invalidate the location on the ground that it was obtained by fraud and misrepresentation. The case has been settled by consent, and the O'Brien syndicate granted a clear title upon their entering into an agreement to pay the Government a royalty of 25% on the value of the output at the mouth of the mine. This arrangement has naturally created great interest as forming a precedent for similar action in other cases of like character, and as showing the disposition of the Government to secure a larger share of the value of provincial mineral resources for the public. The action against the O'Briens, though in the name of the Government, was regarded as being in the interest of Messrs. Timmins, McMartin, and Dunlap, the big men of La Rose, who anticipated an opportunity to obtain the property, had the O'Briens been dispossessed. The course of the Government will arouse much criticism. It is regarded by other than the big mining interests as a timely concession to the growing feeling in favor of public ownership, the advocates of which have lately been active in urging the Government to secure more revenue from the mines. The O'Brien mine has undergone considerable development and before the proceedings were instituted shipped one carload of ore from which $61,000 was realized.

At the Gilpin mine, Bucke township, a new calcite vein, carrying silver, has been found in shaft No. 2 at the depth of 13 ft. This makes the thirteenth vein struck on this property.——At the University mine there are 60 men at work. A compressor and electric-light plant are being installed, but the work proceeds slowly by reason of the scarcity of skilled labor. —— S. D. Eplett, Fred Fisher, and James Kinier, leading Cobalt prospectors known as the 'Big Three,' have sold their claim on Lot 1, Concession 4, Coleman township, to L. H. Timmins, N. A. Timmins, and David A. Dunlop, of La Rose, for $100,000. It has 1,800 ft. of vein-matter uncovered, and shows cobalt bloom, intermixed with silver. —— F. C. Loring, a well-known mining engineer, has been engaged as superintendent for the Tretheway Silver Cobalt Mines, Ltd. —— B. B. Harlan has bought for $250,000 a property known as J. B. No. 2, immediately adjoining the McKinley-Darragh-Savage and Silver Queen locations. It will be called the Little Nipissing and has been capitalized at $650,000. A first-class equipment will be installed at once.—— Steam machinery has been erected and is in operation in the Kinier shaft of



Map Showing Position of Cobalt and Lake Temiskaming.

the Temiskaming & Hudson Bay mine. —— Dr. Robert Bell, formerly acting director of the Dominion Geological Survey, returned this week from his sixth visit to the Cobalt district, where he made a careful investigation.—— At the Red Rock property a vein containing native silver, with high-grade ore and argentite, has been traced 200 ft. along the surface. A 40-ft. shaft is in operation and a carload of ore is ready for shipment. Capt. Joseph Harris is superintendent.

The continuance of open weather until late in the season has enabled the construction of the buildings of the Montreal Reduction & Smelting Co.'s works near North Bay to be completed. Sidings from the railway are being finished. It is hoped to have the plant at work early in January, but the company declines to make contracts as yet, since unforeseen delays may occur.——In blasting for foundations for a stamp-mill at the Grace gold mine in the Eagle Lake district, a new vein was discovered. The new mill, having a capacity of 50 tons per day, is supplied by the Allis-Chalmers-Bullock Co. Thirty-five men are at work under J. H. Caslor, the manager. —— Anthony Blum, principal owner of the Laurentian gold

mine, Manitou Lake district, who has refused several very large offers to part with a controlling interest, will hand over the property to a company capitalized at $5,000,000, of which stock he will hold the greater part. Prof. Hille recently visited the mine, and will make an exhaustive report to the Dominion Geological Survey. Development work is now being steadily pushed, the main effort being directed toward tracing the whole vein — the bottom of which has not been found. It is rich ore, known to be from 4 to 14 in. thick and 30 ft. long. The shaft is now down 280 ft., with no falling off in quality.

A great rush is reported to recently discovered placer gold diggings just east of Maidstone, in Saskatchewan. Gold has also been found at Birling in the same vicinity, which leads to the belief that the field may be an extensive one. A large number of claims have been staked and an influx of gold-seekers is settling on Maidstone, the nearest point that can be reached by rail. —— Dr. J. S. Island, of Toronto, who has been experimenting on behalf of the Ontario Government to discover a process for the treatment of Cobalt ores, claims to have succeeded. He shows a specimen of the ore in matte form, 67% pure silver, and also the chemically pure silver withdrawn from it. He is certain that he has hit upon the formula employed in the New Jersey smelters, the secret of which has been jealously guarded.

London.

Tanganyika Concessions.—A Big Copper Region in Africa.—Financial Operations on a Large Scale.—Important Enterprise.—Old Botallack Mine to be Re-opened.—Activity in Cornwall.—Interesting Speech From Richard Pearce.—Dull Stock Market.

The long expected meeting of Tanganyika Concessions Ltd. has been held, and the event of the week is the issue of the £2,000,000 debenture prospectus. For some time previously many vain imaginings were indulged in by the market and the press as to the big financial scheme of which an inkling had been obtained. It was asserted with some show of reason that a South African house would be the sponsor for the new development. According to another account, an American group had come on the scene and would exercise a controlling influence on the future of the company. In this connection the Venture Corporation, as having its finger nowadays in many pies, was mentioned. Considering Belgian interests in the Congo Free State, it is a little remarkable that the financial co-operation from that quarter, which is now an accomplished fact, was not generally anticipated. It has taken effect in the registration of a mineral company under the law of the Congo State with its principal office at Brussels, under the name of Union Miniere de Haut-Katanga, to acquire the whole interests in all the deposits already discovered in Katanga. The Mineral Company has £400,000 working capital, one-half of which is subscribed by the Société Générale de Belgique. A curious condition has been made that no shares of the Mineral Company can be dealt in for three years. The Tanganyika Company has created £2,000,000 5% debentures in bonds of £8 each, out of which its moiety of the Mineral Company's working capital will be provided, the remainder of the issue of debentures, over £1,500,000, being available for the Benguella railway through Portuguese West African territory to Katanga, just over the border of the Congo Free State. The debentures are convertible at any time at the option of the holders or up to December 31, 1911, into fully paid shares of the company at the rate of one fully paid share for every £8 of the nominal amount of the debentures. Any debentures issued for interest will carry similar conversion rights. The debentures will be secured by a trust deed creating a specific first charge on 90% of the issued share capital of the Benguella Railway Company, and on the shares to be received in the Mineral Company about to be formed under the laws of the Congo State, less the shares reserved to commute prospectors' interests, and a first floating charge on all the other assets except the Rhodesian assets. It appears to be the intention to satisfy the interest accruing on any debentures up to December 31, 1911, by allotment of fully paid further debentures of the same series, but except for the purpose of paying the interest, no further debentures may be created to rank *pari passu* with or in priority to this issue. At the meeting, the managing director, Robert Williams, who together with his coadjutors George Grey, manager, and the engineers Farrell and Bayne, is likely to figure largely in the annals of North Western Rhodesia and the bordering region of the Congo Free State, gave a striking summary of the position of Tanganyika Concessions Ltd. in that belt of country now being reclaimed from desolation and savagery for commerce and civilization. He pointed out that with an issued capital of £525,000 they own 45% of the copper already proved to exist, amounting to 2,000,000 tons, which at only £50 per ton, represents £100,000,000 sterling. Taking half of this as profit, under economic working conditions there would be a profit of £50,000,000 of which the Tanganyika Company would be entitled to about £22,000,000; from values proved in only 10 of the 100 mines discovered. The Company also owned 65% of the Kansanshi mine, which has a proved value of about £500,000 in 20% ore, and which is within about a year of being connected by rail, besides 90% of the whole Benguella railway and mineral concession, with about £600,000 in a solid railway asset; and when the capital is issued up to the full £1,000,000, then the solid railway asset will amount to about £2,500,000. All this was apart from the tin, gold, and coal values. A few weeks ago a mile outcrop of coal was discovered which had given highly encouraging prospects. He believed the greatest copper industry in the world would be established and one of the greatest factors in carrying civilization into the very heart of Africa. Thus spoke Robert Williams, the pioneer, and in a great measure, the organizer of this vast undertaking, one of the most remarkable of modern times. The arduous nature of the work will be recognized from the fate which befell two of the gallant explorers, C. Cuninghame, who was shot by a hostile band of natives in the Lunda district of Angola, and Mr. Bracken, who died of wounds resulting from being attacked by a wounded leopard in northern Rhodesia. The achievements of such men as these deserve something better than mere cavilling criticism. All the same it must be expected that the dry light of the market will seek to illumine the not always clear mind of the speculator who wants to know whether it is going "to pay." From this point of view a City editor appears to have arrived at an apt conclusion when he says: "The truth about the Tanganyika position seems to be that while the properties are of great potential value, much time is required for their development; and that because of the heavy speculation in the shares, these may suffer much before the properties become dividend-earning. The reports upon the properties are scarcely as explicit and as well-authenticated as they might be, but on the whole it seems safe to regard them as exceedingly rich. But the Benguella railway cannot well be completed for five years or so, and even the Rhodesia Railways extension—we understand the negotiations are almost completed—can scarcely reach the property for about a couple of years. Meantime the shares may be knocked about by the bulls and bears anyhow."

Changing the scene to Cornwall, we are brought face to face with conditions of an entirely different order. We seem to be bringing to light household gods from some long-forgotten room. Here is news that will awaken memories in the breasts of Cousin Jacks in many a rough and distant mining camp, and perhaps cause some of the white workers in South Africa to cast a wistful glance homeward where, if there is less money to be made, life may be less feverish and more complete. The Botallack Mines, Ltd., has been formed with a capital of £150,000 in £1 shares, and the Cornish Consolidated Tin Mines, Ltd., having acquired the properties, invite subscriptions for 100,000 shares at par, and Botallack will start with £60,000 in hand for working capital. The prospectus states that the company has been formed to acquire the Botallack and Buzza mines, situate in the parish of St. Just, seven miles west of Penzance, and, as at present constituted, comprising three setts, all adjoining, known as Botallack, about 200 acres; Carnyorth, about 150 acres; Buzza, or Truthwall, about 200 acres. The lodes on these properties have been profitably worked for tin and copper throughout a long period, although little is known of the results previous to 1802, while from that date to 1836 Botallack was worked only in a small way by five adventurers, who are stated to have divided £34,000 as profits. From 1836 the records of the first cost-book company show that the ores sold from Botallack from 1836 to 1895 were: Tin ores, value £829,664; copper ores, value £220,701; arsenical ores, value £6,481; tota £1,056,846. The result of working Botallack mine for tin for the last five years immediately preceding suspension, namely, 1890-4 inclusive was: Black tin sold in the five years, 1,880 tons for £92,270. The average selling price of this black tin for that period was £49, while it is now about £120. Mr. William Thomas, who is to be the manager of Botallack, has been presented with a massive silver salver by the students of Camborne School of Mines on his retirement from the post of Mining Instructor at the School. It is reported that the Wheal Ellen group of copper and blende mines, adjoining the Tywarnhaile mines in the Porthtowan district of St. Agnes, have been acquired by by influential Midland company, and they intend at once to develop the properties vigorously under Mr. Henry Gripe, of St. Agnes. In East Ellen nothing has been done below the deep adit (60 fathoms), although large and strong lodes are to be seen above this point. Already a shaft has been sunk to the deep adit, and skip and ladder-ways fixed. On the surface is an up-to-date head-gear with ore-bins. It is now proposed to sink this shaft to prove the lodes in depth, as well as to raise and dress the blende from the lodes now available for stoping. A neat and compact dressing plant has been installed, consisting of Cornish rolls, and several three-compartment jiggers and Green's patent vanning table and buddles. Turning to the old established mines, the accounts of Levant Mining Co. for the 16 weeks ending October 6, showed that upon an expenditure of £12,141 a profit of £7,168 had been made, as compared with an expenditure of £12,239 and a profit of £6,414 for the previous period. For the sale of tin £15,382 was realized, as compared with £14,425 for the other period, giving an average price per ton of £110. 8. 2 against £111. 12. 9. The copper sales brought in £3,112 as compared with £2,774. The balance in favor of the 'adventurers' amounted to £10,228. At the 'adventurers' meeting, the resolution was passed: "That after the next 16 weeks' working a sum equal to 10% of the dividend declared be divided amongst the staff, the tutwork men, and wages men, in proportion to the wages earned by them in that period." It is doubtful if this policy will be generally approved in Cornwall. It seems open to the criticism that it may act unfairly in attracting the more skilled miners from the mines which want them most, that is to say, those undergoing development and exploration, but which cannot for some length of time reach the dividend-paying stage. The latest news from Grenville United mine is to the effect that the repairs to the 'bob' having been completed, pumping has re-commenced, and that a rich discovery of tin has been made (as predicted by the manager at the last meeting) in the 320-fathom level west of Fortescue's shaft. Samples assayed are said to have yielded 20% black tin to the ton of stuff. This discovery is a continuation of the great Flat Lode, the principal vein of the mine, and it will take some time to drive through it.

The annual meeting of the Royal Cornwall Geological Society was held at Penzance last week. According to a report in the *Cornish Post*, the president (Mr. Richard Pearce, of Denver,) in the course of his address referred, principally, to that branch of economic geology having a direct bearing on the mining industry of Cornwall. During the past year Cornish mining seemed to have taken a new lease of life, pessimistic despair had given place to the brightest expectations for the immediate future welfare of Cornish mining. Although that improvement was in a great measure due to the advance in the price of tin, another very important feature had been found to play a part in those improved conditions—the discovery that the tin lodes do not, in all cases, indicate barrenness as greater depth was reached. The recent developments at Dolcoath, at a depth of 3,000 ft., proved most conclusively that the old classic veins did not become exhausted at a paltry depth of 2,000 or 3,000 ft., and that lodes which had been found to be rich in tin at no very great depth from the surface, and had shown evidences of barrenness at deeper points, might still reward the pluck and enterprise of the miner, who had faith in deep mining, and the 'wherewithal' to prosecute his search. As tin appeared to be intimately associated with the older eruptive rocks, they were hardly warranted in thinking that tin veins became extinct, or had reached a point where they were no longer productive, at the very moderate depth yet reached by Cornish mines.

The nineteen days mining account just ended is said to be regarded as having been entirely undistinguished, except in the matter of dullness, without much prospect of better things in new time.

Some interesting details are published regarding the present position of gold and silver mining in Sumatra. The deposits on the island are now being worked by three undertakings, the Redjang Lebong, the Ketahoen, and the Lebong Simau. According to Mr. A. Yates, the assistant manager of the first-named company, these deposits have been worked from very early times, probably at about the same date as the Phœnicians were trading in Cornwall. The ancient workers evidently only scratched the surface, seeing that the longest galleries only extended to 150 ft. The lode is a quartz-breccia, and averages 15 metres thick; it assays over an ounce per ton, while the ratio of silver to gold is as 10 to 1. The present plant consists of 40 stamps, which it is proposed to increase to 70 stamps and six tube-mills in about five years' time. By means of an all-slime plant, which it is suggested should be provided, over 90% extraction will probably be obtained. The mill only gives about 3 dwt. gold, the sand-plant recovers about 80% of the sand-value, and the slime (filter-press) plant 94%. Working costs average about 35s. per ton, the high rate being due to transport difficulties, but these are expected to be reduced to 25s. per ton when work is undertaken on an enlarged scale.

Mining Summary.

ARIZONA.

COCHISE COUNTY.

The fourth furnace at the Calumet & Arizona smelter is now in blast. A fifth furnace, completed several months ago, is being held in reserve. At the mine, several improvements are under way, including a new machine-shop and a new blower. The old power-house is being torn down in order to make room for more furnaces. The management is evidently preparing for a bigger production.——Another smelter is to be built in the Globe district, according to H. H. Freeman, a mechanical engineer, representing the Mitchell Mining Co.; the site is to be on Pinal Creek, three miles from Globe. The capacity is to be 200 tons per day, and the ore is expected to come from the Five Points, Schulze, and Banker claims.——Good ore has been found in the Queen Mining Company's property at Superior. The old shaft of what was formerly a silver mine has been reopened to the 400-ft. level and good copper ore has been found both at that level and at the 300-ft. It is three or four feet wide and carries from 10 to 16% copper, together with some silver. J. W. Banhauer is superintendent. The ore will be shipped to the American Smelting Co. at Humboldt.——On Nov. 15 the workmen in the Warren mining district received an advance in wages at the rate of a uniform raise of 25c. per day. This applies to smelter employees also. At Globe a similar increase was given.—— The new 10-drill compressor of the Globe Consolidated has been erected on the Gem claim and machine-drilling is now in progress. The shaft is being sunk rapidly under the direction of H. B. Hovland, the president of the company.—— Charles S. Smith, the president of the Old Dominion Co., has gone to Globe to meet Mr. James Douglas and Mr. L. D. Ricketts in order to decide the question of building a railroad to bring the ores of the district east of Globe to the Old Dominion smelter; the acquisition of further mining territory is also to be discussed. It is possible that the smelter may be increased, as the old mine promises to maintain a large output.——A rich strike has been made in the Scanland mine, situated in the Paradise mining district. It is a large body of copper ore and it was found at 300 ft. deep. The ore is suitable for concentration.

The company known as the Arizona Mining & Development Co., in which C. G. Jones and others of Oklahoma City were interested, has been reorganized as a result of recent litigation, and is now operating the mines in the San Jose mountains, nine miles from Naco, under the name of the San Jose Gold Mining Co. The mill on the property has been operated at a profit of $300 per day. The Shattuck-Arizona and the Denn-Arizona companies will erect a smelter to handle the output of their mines situated in the Warren district. The capacity will be equal to the output of the Shattuck mine, and plans will be made for the smelter's enlargement at such time as it may be necessary.

PINAL COUNTY.

(Special Correspondence).—The smelter for the Silver Bell mine at Kelvin is assured. A. G. Rockefeller, of Tombstone, has been on the ground to lay out the site. The plant will be situated eight miles south of Red Rock, on the hills that form the southern bank of the Santa Cruz river. All ore can be handled by gravity, and the smelter will be modern in every detail. —— The re-timbering of the Wooley shaft of the Arizona-Pacific Co., under the management of S. C. Prunty, is proceeding rapidly. —— R. G. Wilson has completed his second contract in the Copper Peak adit, which now has a length of 200 ft., all in copper-bearing breccia. It is probable that a diamond-drill will be employed to prospect the main vein, which lies against a typical trachyte uplift running parallel with the stratification of the copper-bearing breccia. The vein lies about 800 ft. north of the adit. —— The Kelvin reduction plant is now running full time, having started leaching on Nov. 5 with J. M. Mead in charge.——The Zellenager new shaft, under the direction of J. L. Powell, is progressing rapidly and is down 70 ft. They expect to connect with the vein in the old workings in two weeks. —— James Elder, who has a lease on the old Ray dump at Kelvin, has three carloads of high-grade ore ready for shipment to the smelter at Humboldt. —— The Big Lead Co. at Kelvin is completing its 10-stamp mill, which will be so constructed that after leaving the crusher the ore will pass through the plant by gravity. —— The Buckeye-Calumet-Arizona Mining Co. is to begin making regular shipments of ore next week.

Phœnix, Nov. 19.

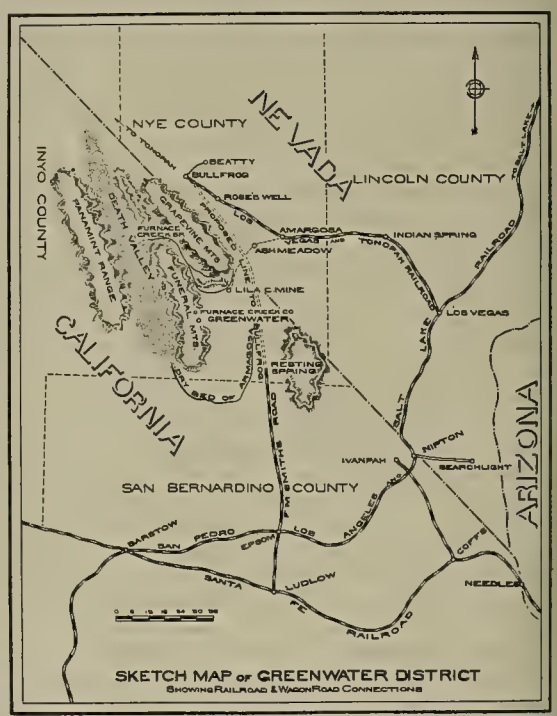
YUMA COUNTY.

The Reliable group of claims situated near Quartzsite has been sold to the Ventura Mining Co. organized by New York capitalists. Negotiations were closed in New York by Hugh Creighton, brother of H. S. Creighton, the owner of the mine. The Reliable group was purchased two years ago by Creighton from Mercedes Downey of Yuma, and consists of seven claims, situated four miles north of Quartzsite, in the Plomosa district. Five hundred feet of development has been done, on a lode nine feet wide, a mill-test of 100 tons of ore yielding $12.80 per ton.

CALIFORNIA.

INYO COUNTY.

A shaft sunk on the Furnace Creek Copper Co.'s property has reached a depth of 275 ft. with a cross-cut at



250 ft., which has uncovered an orebody 300 ft. wide. This mine, being the most developed among Greenwater claims, ranks first in value, with the Schwab property a close second and the Copper Shoes of the Furnace Creek South Extension Co., third.

LOS ANGELES COUNTY.

E. A. Gray and associates are working the river bottom in the San Gabriel cañon with some success, and have taken out a number of nuggets from the gravel at the Horse Shoe placer. The placer is situated 30 miles from Azusa, just below the narrows. The San Gabriel yielded $14,000,000 worth of gold in the days before hydraulic mining was stopped.

NEVADA COUNTY.

Work is to commence shortly on the long adit of the Bear River Con. Co.——A new tunnel has been commenced at the Jenny Lind gravel mine to strike the ancient river bed. It has been decided to extend an old tunnel, some distance above the one through which operations are now carried on, and thus secure direct communication with the gravel bed. On the completion of the new tunnel, the old system of

working will be discarded. The mill is kept running on gravel of fair value.

SAN BERNARDINO COUNTY.

A new mining region is being opened up in the Avawatz Mtn., adjoining the westerly edge of Death Valley. Widely scattered arastras, however, show that Spanish miners worked the surface nearly a century ago. The camp has been organized into the Crackerjack district, and is about 36 miles square, 60 miles northwest of Daggett, the nearest railroad point being Silver Lake station, 23 miles distant, to which the Tonopah-Tidewater R. R. has lately been completed. Gold, copper, silver, and lead are found, and the district is generally considered to be a continuation of the Tonopah, Goldfield, Bullfrog, and Greenwater mineral belt. The Crackerjack Co. has four claims, on which a shaft is being sunk all in ore. A three-foot vein assaying $114 and a two-foot vein running $128 per ton have been opened up. Adjoining the Crackerjack on the southeast is the Tomboy, a group of claims owned by Los Angeles people. Although but little work has been done on this property, assays are said to run high and the continuity of the orebody is shown by a cañon outcrop 200 ft. deep. The Beck & Wilson group has an outcrop of ore from 6 to 12 ft. wide. The workings yield ore from $11.55 to $75 per ton. The district has already had its first milling, the result being a gold brick worth $1,200, from the Rose & Palmer claims. A townsite will be laid out at once adjacent to the Crackerjack claims, and a stage line is soon to be operated from Silver Lake station.

SHASTA COUNTY.

The Mammoth Co. has installed two additional blast-furnaces at their Kennett plant. Two large converters are also to be added, in order to supplant the present practice of shipping matte to Utah. A big machine-shop is to built commensurate with the improvements to the plant. Twice the present number of men will be required, and the future smelter as planned will be the most complete plant yet built in California. At the Mammoth mine a compressor, four times the size of the one now in use, is to be installed, capable of operating 35 to 40 drills. This company is also setting up a five-drill compressor at the Quartz Hill mine.

SISKIYOU COUNTY.

The St. Louis Co., which recently purchased 100 acres along the Klamath river in the Riverside district, is about to start vigorous mine-development.

TRINITY COUNTY.

The Trinity gold placer, on Coffee creek, cleaned up for the season on Nov. 10. M. P. Rose is running a tunnel on his property, near the Nash mine, and has found some good-looking ore. Tom Keating has commenced to build another arastra 100 ft. below the site of his old machine. The greatest activity in this district is around the Bonanza King mine, of which Joseph Porter is manager. The Jubilee mine is employing 20 men and it is expected to run throughout the winter.

TUOLUMNE COUNTY.

(Special Correspondence).—W. A. Nevills will soon become the sole manager of the Rawhide and App mines again, according to reports. He has borrowed $100,000 from the Central Loan & Trust Co., of Fresno, to liquidate the indebtedness on these properties, giving a deed of trust as security for the loan. Many look forward to much greater activity at Mr. Nevills' mines in the near future.——The Yankee Hill Co. filed articles of incorporation in this county last week. The capital stock is $30,000, with shares at $50 each. The amount subscribed is $25,000, and the principal place of business is Columbia, Cal. The directors are J. Tom Williams of San Antonio, Tex., Will L. Vining of Austin, Tex., and S. H. Robinson, Irvin Lewis, and L. Kress of Columbia, Cal.——It is reported that a wealthy company will soon begin operations at the Mountain Bell and Parallel mines, situated near Soulsbyville. Considerable development work has been done on the former and rich ore taken out, some of which yielded $70 in free gold per ton. Work was discontinued, however, by the owners owing to lack of machinery. The Mountain Bell vein is supposed to be the same as the Soulsby, the Mountain Bell being a short distance north.——Development work is being pushed at the Oak Hill mine, in the western part of this county. The crew employed was augmented this week. The outlook for this property is decidedly good.——San Jose people have bonded the Mt. Hood, situated near the Rawhide, and are having the mine unwatered.

Tuolumne, Nov. 19.

The Wheal Rough mine, idle for many years, is to be reopened. The property is situated in the Soulsbyville district, and on the same vein as the Black Oak. The last work done on the Wheal Rough was in 1868, when it was closed down by its owner, the late E. Richards, a merchant of Sonora. The shaft is 108 ft. deep, with two 60-ft. drifts from the bottom, and the quartz is stoped out to within 40 ft. from the surface. The vein is said to be from one to two feet wide and yielded from $30 up to as high as $112 per ton in free gold, no concentrates being saved in those days. The mine has been purchased by a company from Mrs. E. C. Wetmore and C. M. Richards, and a force of men will at once be put to work to clean out the shaft.——Rich ore has been struck at the Yorktown mine on the Ida Klein ranch, near Stent. The property is being developed by Messrs. Lyon, Baum, & McFarland, who have an efficient hoisting and pumping plant in operation. The shaft is down 60 ft. with a cross-cut that has cut the vein.

COLORADO.

BOULDER COUNTY.

The Eastern purchasers of the Copper King group on Boulder Mtn. have given instructions to proceed with development, and to secure U. S. patent to all of their unpatented claims. The main adit to cut the Copper King vein will be started on the west end of Boulder Mtn., and will strike the vein 1,000 ft. from its portal, at a vertical depth of nearly 1,000 ft. The ore is a lead sulphide, carrying silver and some gold. The vein is over 100 ft. between walls, a large proportion being rich enough to justify shipment in the crude. The new company proposes to erect a large mill at the bottom of Hancock gulch next summer, which will be connected with the mine by means of the improved Bleichert tramway from the mouth of the adit. An air-compressor will be installed, and work will be pushed until the vein is intersected. In the meantime the upper workings will be developed.

CLEAR CREEK COUNTY.

(Special Correspondence).—The Chamberlain sampling works report an increase in ore shipments of 50%. The Ramsdale Co., recently incorporated, has now completed its boarding-house, ore-house, and blacksmith shop at the mine on Lincoln Mtn. The lode for a width of three feet assays from 0.5 to 2 oz. gold, 30 to 80 oz. silver, 34 to 40% lead. The company is planning to build a concentrating and cyanide plant, for which bids will be called immediately.—— The Stella Mining Co. has taken hold of the Antelope mine on Republican Mtn., and is now driving the main adit. —— The Georgetown Leasing Co. is making good progress on the Lone Tree and Brannigan lodes on Leavenworth Mtn., and expect to be shipping pay-ore shortly.—— The Main Gulch Mining Co., operating the Smuggler mine above Silver Plume, made a 100-ton shipment of lead-zinc ore of the usual grade this week. The shaft is now down 260 ft. and will be sunk 150 ft. more. On the 176-ft. level, 70 ft. east of the shaft, there is two feet of silver-lead ore; west from the shaft there is also a fine orebody.——John Reily and Joe Roehel, who have a lease on the Sceptre lode on the Red Oak property, Democrat Mtn., have just opened up two feet of ore that assays 124 oz. silver per ton, 15% zinc, and 20% lead. —— Dave Crandell, while doing the assessment work on the McKinley lode, adjoining the Ramsdale property, opened up a foot of ore that assays as high as 10 oz. gold per ton.——The Southern Co., working the Poor Man's Relief and other lodes, has let another contract to drive the adit 100 ft., to the junction with the R. E. Lee lode. —— The old Peruvian mine, in the horseshoe over Argentine pass, is now being put in shape for extensive development work by a group of Idaho Springs mining men. This property has a good record. —— The Key West Co. is driving the McKinney adit, and in the raise at 350 ft. from the entrance there is a

fine body of concentrating ore, averaging $10 per ton.—— At 100 ft. from the portal of the Plebian adit on Columbia Mtn., a 12-in. vein, assaying from 100 to 350 oz. silver, has just been encountered. —— The Charter-Raton Co. has now completed the erection of its 80-h.p. air-compressor plant. The machine-drills are at work driving La Moe adit ahead. Charles Morris is superintendent. —— The Capitol Mining & Tunnel Co., of which William Cooper is superintendent, is still driving the main adit, although the ore recently encountered, while passing through the Ætna lode, is three feet wide and worth $30 per ton. Before working this orebody it is the intention of the management to have everything in readiness so that continuous shipments can be made. Large ore-bins are being built, and after proper tests have been made to ascertain the best method of concentration, the company will erect a plant of its own, having purchased several town-lots this week as a millsite.

Georgetown, Nov. 16.

(Special Correspondence).—The Dives-Pelican mill is being remodeled so as to increase its capacity. An aerial tramway, in addition to the one already installed, is being added to the plant and will transport ore from some of the old dumps to the mill. The tramway when completed will be about half a mile long. A 1,000-ton storage-bin is being erected at the top of the mill and the crushing department will be adjacent to this bin instead of at the bottom of the mill as at present. The ore will be drawn from the bin to the crusher and from there through a Crane washer, over a sorting device, through the jigs, to the concentrating tables. It will require about two months to complete the equipment.——It is understood that McGrath & Stevens cleaned up during the past year about $24,000 from their lease on the Mendota mine and dump. During the summer months they operate on the dump and block out ore in the mine. In the winter the ore is brought from their lease in the mine and put through the mill, which has a daily capacity of 50 tons.——The Scotia Mines Co. (J. H. Crawford, general manager) is operating its mill on ore from its own mine. This mine was operated up to the time of the panic of 1893, but since that time little work has been done until the present company assumed control. The mill is capable of handling 50 tons per day.——Joe. B. Warner, for many years manager of the Ledge mine near Silverton, and now representative of the Nashotah Mines Co., is constructing a mill with a daily capacity of 250 tons to handle the ore from the old Cory mine. It is estimated that the dump contains 500,000 tons and that there is about the same amount in the stopes; all of this stuff will be put through the mill. This mine was operated more than thirty years ago when nothing but high-grade material could be exploited on account of the difficulty of transportation at that time.

One of the big enterprises of upper Clear Creek county is the Vidler tunnel, which is being driven under Argentine pass by Rees C. Vidler and associates. He is operating at present from both sides of the mountain and recently opened up an orebody about 10 ft. wide, which is being explored vigorously. It is estimated that there is enough ore in sight to keep the 100-ton mill supplied for a number of years. This mill, which was furnished by McFarlane & Co., of Denver, will be running within thirty days. During the past summer Mr. Vidler has installed a large steam plant consisting of two 80-h.p. boilers, making a total of three boilers; one double cylinder Rand compressor, 1,500 cu. ft. per minute, furnished by Cary & Fielding, of Denver. A large Connersville blower has been installed, which it is estimated will clear the atmosphere at the breast of the tunnel in about 15 minutes. A few days ago the first vein of the Colorado Central system was encountered and shows three feet of pyrite.——The Denver & Transcontinental Ry. was recently incorporated by Charles Baldwin, of Colorado Springs, and Rees C. Vidler, of this place. The object is to construct a standard gauge track from Denver up Clear Creek, through the Vidler tunnel to Argentine and to Leadville, from there to Salt Lake City and San Diego, California. A large corps of surveyors is now in the field selecting the best route for the road. Should this road be built, it will open up a large territory as yet undeveloped on account of the lack of transportation facilities. As a scenic road it will be a success, for it goes through some of the most picturesque mountains in Colorado.——The old Doric property is being operated under lease by the X-Ray Gold Mining Co., of which James Cousins is superintendent. They have recently made a shipment of ore which averaged 15% copper, 3 oz. gold and 40 oz. silver per ton. This company is making a raise to connect with the Griffith, which will give both properties good air when the connection is made.

Georgetown, Nov. 17.

SAN JUAN COUNTY.

The Joe and John mines in Prospect Basin have been sold by Mrs. Katherine Luttrell to a Boston syndicate. The purchase price is stated to be over $100,000; the first payment has been made and the new company is now in possession, R. W. Hollis having been appointed manager. New ore-bins, blacksmith and carpenter-shops are being built so that work can continue uninterruptedly through the winter. In the spring a complete plant will be installed.

NEVADA.

ESMERALDA COUNTY.

The speculation in stocks makes Goldfield extremely lively. Visitors are coming to the camp from everywhere and the stories of new consolidations arouse great interest. It is known that the Combination is bonded to Nixon and Wingfield in behalf of the Goldfield Consolidated and that a deposit has been made in San Francisco. There is a good deal of talk about a million-dollar shipment of ore from the Mohawk, it being a fact that those in control of two leases, namely, the Hayes-Monette and the Frances-Mohawk, are accumulating sacks of high-grade ore for a big shipment. From the Frances-Mohawk lease the output is being crowded; it is at the rate of 350 tons weekly of stuff that averages $250 per ton. The ore is from 8 to 10 ft. wide and contains much free gold. The shaft is 85 to 100 ft. long. It has been stoped at a depth of 300 ft. and to within 100 ft. of the surface.

LINCOLN COUNTY.

(Special Correspondence).—The Searchlight district is now the scene of marked activity, as is evidenced by the sales and transfers of different properties in the camp. A new townsite is being platted at the terminus of the Barnwell & Searchlight R. R. on the flat west of the original townsite.——A sensational copper strike was made recently, 13 miles east of Searchlight, by Thomas Turpin and D. S. Macrea, in the vicinity of Camp Thurman. The vein is 64 ft. wide, and is plainly traceable for a distance of 1,200 ft. Five assays average 6% copper, with some gold. Twenty-six claims have been staked out in the new district. The management of the Searchlight Parallel is sinking an incline 600 ft. west of the present shaft. Owing to the dip of the lode it is estimated that with the new shaft the ore can be extracted at a great saving. On the 500-ft. level 20 ft. of ore has been encountered in a cross-cut; it will average $16 in gold. Water has been developed in sufficient quantities to run 100 stamps, if necessary. —— A contract has been let by the management of the Goldyke Co. to sink the present shaft to water-level, and also to retimber the old workings. The assays obtained during the development work have been very gratifying and work will be prosecuted with vigor. —— At a depth of 240 ft. the Wyoming-Searchlight has encountered water and sinking has been suspended pending the arrival of pumps. Drifts are being run at the 100 and 200-ft. levels to the west. —— A big vein has been opened up on the King Solomon claim of the Superior Nevada. Five feet of ore assays 7% in copper and two ounces in gold. A tunnel is being run into the side of the mountain to cut the lode; it is estimated that 240 ft. of work is required. —— The vein traversing the entire length of the Euchre claim of the Duplex Extension property has been sampled; the assays were satisfactory. —— Recent explorations on the lower levels of the Cyrus Noble mine have shown that the casing of the vein carries gold and silver. What was hitherto considered barren waste below 200 ft. is now being thoroughly sampled. H. E. McCrea, super-

intendent of the Mondamin, is making a survey of that property. The present shaft is down 145 ft. in five feet of ore that will average $18 per ton. A 15-h.p. Fairbanks-Morse gasoline hoist is to be installed. —— Sinking is still proceeding at the Channel City group, four miles west of the Quartette mine. The shaft has reached a depth of 110 ft., and the vein-matter is becoming better defined. Samples from the bottom of the shaft ran from $14.20 to $35.40 in gold, with a trace of silver.

Searchlight, Nov. 12.

NYE COUNTY.

(Special Correspondence).—Rumor has it that the Nevada Southern railway has changed hands and that the new owners will extend the line to tap the northern portion of Nye county. The new camps tributary to Manhattan would profit by such a road and local interest is much attracted by the talk. Among those said to be prominently connected with the scheme are C. S. Lemon and Harry Overman.

A number of Manhattan operators have returned from the vicinity of Dutchman Creek and neighboring camps started by the opening of the Walker Indian reservation. Some fine specimens of gold, copper, and lead ore are exhibited by those who attended the rush and valuable mines are expected in the new territory. However, local people are generally returning well satisfied with prospects nearer home.

A large mill seems to be assured within the near future, as several groups of investors have been investigating the possibilities of custom milling. The Tonopah Exploration Co. has shown more activity than others; these people have surveyed for a pipe-line from their water source, some ten miles distant, in Jett cañon, and they have commenced excavating for the line. The company's holdings include the Little Grey property where there is a large body of ore of milling grade. John Robertson is in charge of the work on the ground. A three-stamp mill has been crushing for several months.

A recent find of copper ore between Cloverdale and San Antonio has been the recent centre of attraction. A townsite is being laid out, bearing the name of Copper City, and the Superior mining district has been organized with Morris Fenbach as recorder. The water supply is at Bank spring on the Pearing road and is only two or three miles from the strike. Average surface samples are said to give returns of 7 or 8% copper, 4 to 5 oz. silver, and about $1 in gold. J. B. Giffen, of the Giffen Mercantile Co., is one of the principal owners.

The properties to the west of the town are showing considerable activity. Among those that reported good finds recently are the Original, Giant, and Hooligan. A large proportion of the miners employed in the district are in this neighborhood, that is, around Central City.

The Seyler-Humphrey, Consolidated, and Pine Nut mines are active in development. The first is operating with a gasoline engine and the other two are hoisting with steam-power. All have reached water-level, which varies between 100 and 200 ft. below the surface.——Over the summit, toward East Manhattan, copper croppings are being opened up at several places. The chief operator is the Toquimo Copper Company.

Local stocks show a slight upward tendency owing to encouraging reports from the properties and the general effect of the rise in Goldfield shares. A generally optimistic tone is prevalent and the effect of the slump due to the San Francisco disaster appears to be past. About 150 miners are employed near town.

Manhattan, Nov. 18.

Charles J. Kanrohat, owner of the Sierra Nevada mine at Jefferson cañon, is arranging the sale of that property to an Eastern firm for $175,000. There are 16 claims in the group. ——The vein on the Nevada Wonder group at Wonder is said to be proved to a depth of 110 ft., showing an average width of 13 ft. and value of $100 per ton.——A group comprising four claims adjoining the Stray Horse and Castle Rock has been purchased by Patrick, Elliott & Camp of Goldfield. The original locators had succeeded in opening up shipping ore at three different points on a vein which runs directly through the property, and bisects the entire northern portion of the camp.——The strike of a rich stringer is reported at the Fairview-Round Mountain mines in the bottom of No. 3 shaft. The stringer is 3 in. wide and rich in free gold.——The old Charles mine in Jefferson cañon has been sold to C. O. Olive, Nelson Rounsvell, Fred Tarbell, and associates. The property has been worked by Charles Harrison for 35 years, and there are over 3,000 ft. of workings. In the '70s several sensational runs were made through the old mill in Jefferson cañon, the output in the year previous to the demonetization of silver being $160,000. Harrison was one of the few who did not abandon his silver properties, and from time to time with a crude home-made arastra he treated small lots of high-grade ore taken out in the course of prospecting. The group has a total of 18 claims and has been incorporated as the Round Mountain Alleghany. The Charles mine takes in the principal claim of the group, and will be cleaned out at once, then sampled, and a test run made to determine the character of mill required. A water right goes with the deal that is reputed one of the best in this part of the State.——The first mint returns from Round Mountain ores have been received from several runs made through the Moore & Chapman mill two weeks ago. W. Munholland, owner of the lease on the Daisy fraction, heads the list with a check for $2,981 from the San Francisco mint. This was for a net weight of 209.94 oz., or nearly 18 lb. bullion. The gold was of a fineness of $14.39 per oz.—— The Round Mountain Imperial Co. is developing the Mary McLane fraction. At a depth of 71 ft. a drift was started which is now 45 ft. long in gold. This company also owns the Annie Rooney fraction and four claims about 3,000 ft. south of the Cahill. These show strong outcrops. Little work has been done on these veins, but surface assays gave an average of $18.82.——Three machines are being run at the placer diggings on the Sunnyside claim of the Round Mountain Co., and the Blue Jay claim of the Combination Mining Co. From the latter a clean-up was taken last week amounting to 211 oz. The gold will run about $14 per ounce.

CANADA.

BRITISH COLUMBIA.

While the coal miners' strike has cut down the output of ore from the Rossland mines, it has made little difference in the number of men employed. At Le Roi, for example, the number of men has been increased with the development work in progress. The Centre Star, White Bear, and Mabel have about the same forces as usual.——The widening of the lode in the Mabel to four feet of shipping ore, reveals that there is some good ground in that vicinity. The shaft of the Centre Star has reached the thirteenth level, which is 1,800 ft. from the collar, making it the deepest shaft in the province.

The report for the six months ending June 30, 1906, submitted recently by W. H. Aldridge, managing director of the Consolidated Mining & Smelting Co., Ltd., of Canada, shows that, after writing off expense of incorporation and $45,905 as depreciation upon plant and equipment, the operating profit is $325,854. The gross value of metals produced by the smelting works has been over $22,000,000, and during the six months the gross value was about $3,000,000, of which $1,622,450 came from the company's own properties. Referring to the development work upon the group of claims controlled or operated by the company, Mr. Aldridge states that 14 miles of underground work has been done in the Centre Star and War Eagle, and nearly eight miles in the St. Eugene. In order to secure a regular supply of smelting ore, the Consolidated Co. has entered into an arrangement by which it will operate the Snowshoe gold and copper mines under lease. Since the close of the fiscal year, negotiations for the purchase of the Iron Mask mine have been concluded. This property adjoins the War Eagle on the east, and the Centre Star on the north. In the past there has been litigation between the Centre Star and Iron Mask which this purchase will render impossible in future. Owing to personal reasons, James Cronin has resigned active management of the mines, and has been replaced by R. H. Stewart.

Personal.

J. H. CURLE is in the Tyrol.

OLIVER WETHERED is at New York.

ARTHUR WINSLOW is in San Francisco.

CHARLES BUTTERS is on his way to Salvador.

R. GILMAN BROWN is on his way to New York.

W. R. VAN LIEW is at Bloomfield, N. J., on a visit from Russia.

W. E. RENSHAW, of Idaho Springs, Colo., is in New York.

H. W. TURNER is examining mines in Sierra county, California.

GEORGE H. EVANS is examining mines in Kern county, California.

FRED JONES has recently returned from Goldfield, Nev., to Denver.

EDWARD SKEWES has left Texada Island, B. C., on his return to London.

ALTON L. DICKERMAN has returned to Colorado Springs after a long absence.

DAVID MCCLURE, manager of the Gwin mine, is on a visit to San Francisco.

R. W. HOLLIS is manager for the Joe and John mines near Silverton, Colorado.

JOHN T. KEEGAN is operating the May-Flower mine at Idaho Springs, Colorado.

JOHN A. MCLEAN is now manager of the Mayflower mine, at Howard, Oregon.

C. F. BORELL is superintendent of the Dives-Pelican mill at Silver Plume, Colorado.

D. J. PULLINGER, of London, is expected in San Francisco from Mazatlan, Mexico.

THOMAS HOATSON and JOHN HOATSON, of Calumet, Mich., are at Bisbee, Arizona.

JEROME SMITH is manager for the Democrat Mtn. M. & M. Co. at Georgetown, Colorado.

JESSE J. MACDONALD is now at 301 Livingston Hall, Columbia University, New York.

FRED. G. FARISH has returned from Helena, Mont., and is now on his way to Mexico City.

E. A. WEINBERG is acting as advisory engineer to the Mt. Elliott Co., at Cloncurry, Queensland.

D'ARCY WEATHERBE has accepted the management of a copper mine in the Argentine Republic.

LEO VON ROSENBERG passed through San Francisco on his way from Idaho to Prescott, Arizona.

CHARLES F. SHELBY has left Globe, Arizona, and is now with the Greene Con. Copper Co., at Cananea.

S. H. WORRELL is manager of the Rey Solomon mine, in the Santa Eulalia district, Chihuahua, Mexico.

C. W. MERRILL, metallurgist to the Homestake Gold Mining Co., is visiting his home at Alameda.

F. C. ROBERTS has come from Ventanas, in Durango, Mex., to order machinery from San Francisco.

JOSEPH C. ERMAN is now general manager for the Troy-Manhattan Development Co., at Troy, Arizona.

J. A. STEWART, of Houghton, Mich., is now at De Lamar, Idaho, with the De Lamar Mining Co., Limited.

DEANE P. MITCHELL is now manager of the Oroya-Brownhill mine at Kalgoorlie, Western Australia.

J. B. WARNER is manager for the Nashotah Mines Co. at Silver Plume, Colorado, with headquarters at Denver.

E. C. ENGELHARDT has been appointed manager for the Hercules Gold Mining Co., at Deadwood, South Dakota.

WALTER P. JENNEY, who is now at Tonopah, has been examining mines in the Uba Hebe range, in southwestern Nevada.

W. W. BRADLEY has resigned as mill foreman for the Standard Con. Mining Co. at Bodie, Cal., and he is now at Berkeley.

KEIJIRO NAKAMURA, chief metallurgist at the Besshi copper mine in Japan, is visiting the copper mining regions of America.

DONALD CLARK has been appointed director of the Bendigo School of Mines, resigning a similar position at Bairnsdale, Victoria.

REES C. VIDLER, of Georgetown, Colo., sails on December 8 on the *Campania* for London, where he will be for some time at 53 New Broad St.

N. C. GROCH, of Deadwood, S. D., and FRANK HALL, of Telluride, Colo., are now with the New York & Honduras Rosario Mining Co. in Honduras.

T. E. SCHWARZ, consulting engineer for the Iron Silver mine at Leadville, and the London mine at Alma, has returned to Denver from an inspection of these properties.

Obituary.

MARCUS MAACK, late manager of the Blue Ravine mine, in Sacramento county, died at Oroville, in Butte county, California, on November 7. His fatal illness was typhoid pneumonia. He was one of the best miners in the State and was highly respected for his uprightness of character and kindness of heart. Cut down in the prime of manhood—for he died when only 36 years old—he will be mourned by many friends.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, November 21.

Argonaut	$4.70	Furnace Creek	$4.00
Con. Virginia	1.25	Savage	0.98
Mexican	1.05	Sierra Nevada	0.87
Ophir	3.00	Yellow Jacket	1.05
Belmont	6.75	Montana	3.95
Jim Butler	1.50	Mohawk	16.25
Jumbo	4.15	Red Top	4.05
Jumping Jack	0.52	Sandstorm	0.85
Manhattan Con	1.00	Silver Pick	1.90
Midway	2.60	Tonopah Ex	7.50

ANGLO-AMERICAN SHARES.

Cabled from London.

	November 15. £ s. d.	November 22. £ s. d.
Camp Bird	1 9 6	1 9 0
El Oro	1 7 6	1 7 9
Esperanza	2 10 6	2 13 0
Dolores	1 10 0	1 12 6
Oroville Dredging	1 1 9	1 1 0
Stratton's Independence	0 3 9	0 3 6
Tomboy	1 13 0	1 12 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Closing Prices— November 15.	November 22.
Copper—Lake (cents per lb)	22¼ @22½	22¼ @22½
" Electrolytic "	21.55@22	21.65 @22
" Casting "	21⅜ @21⅝	21½ @21¾
Lead "	5.75	5.75
Spelter "	6.36	6.38 @6.43
Silver (cents per oz.)	71⅜	71¼

CURB QUOTATIONS—NEW YORK.

	Closing Prices Nov. 15.	Nov. 22.
Bingham Central	2	2
Boston Copper	30¾	30½
Calumet & Arizona	154	162
Cumberland Ely	12½	12⅝
Dolores	8⅜	8⅜
El Rayo	7½	7⅜
Guanajuato Con	4¾	4¾
Giroux Con	11¾	11
Greene Con	26⅜	26¼
Nevada Con	20	19⅜
Nipissing	30⅛	28½
Tennessee Copper	45	47¾
Tonopah Ex	7⅜	6⅞
Tonopah-Belmont	7¼	7¼
Tonopah	20¼	20¼
United Copper	72¾	75½
Utah Copper	34	34

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

INFLAMMABLE GASES are found even in metalliferous mines, usually in old workings where the carbureted hydrogen has been generated from rotting timber in water.

CHEMICAL INVESTIGATION of many eruptive rocks has detected the presence of gold and silver under such conditions as to leave little doubt that they were original constituents of these rocks.

THE discoveries connected with radio-activity have enormously increased the estimated stores of energy surrounding us, but these stores have not yet yielded up mechanical effect for the use of man, if we except the radium clock.

METALLIC GOLD occurring in pyrite is sometimes coated with a film of sulphide of iron or other base metal so thin as to be unnoticed, the color and lustre of the gold being maintained. This, however, is often sufficient to prevent amalgamation.

THE complete cost of a one-story iron building, such as would be suitable for a furnace shed, storage house, etc., is 40 to 60 cents per square foot of ground covered. A building 309 by 42 ft., weighing 10.5 lb. per sq. ft. cost 44.65c. per square foot.

IN 1877 telluride ores were discovered in Boulder county, Colorado. Two years later these ores were found in La Plata county, and in 1891 the most notable and productive deposits of the world were discoved at Cripple Creek, in the same State.

WHEN a corrugated iron roof is to be laid on boards nailed to the rafters, it is advisable to lay waterproof paper between the iron and the boards, especially in buildings where steam comes in contact with the roof. The paper makes the building warmer and prevents dripping.

PLAIN GLASS, wire-glass and ribbed glass are all used for glazing the windows and skylights of factory buildings. Ribbed glass should be placed with the ribs vertical, otherwise the glare is apt to be trying. Wire netting should always be stretched under skylights of ordinary glass, to prevent accidents in case of breakage.

GALVANIZED IRON is unsuitable for buildings intended to contain furnaces that will develop sulphurous fumes, since these will corrode the zinc with which the iron is coated, and the galvanic action set up between the remaining zinc and the uncoated iron hastens the destruction of the latter. Painted corrugated sheet iron becomes preferable.

ASBESTOS is a general name given to the fibrous varieties of two distinct minerals — serpentine and hornblende. Chrysotile, the porous variety of serpentine, is exclusively mined in Canada. Associated with serpentine, the asbestos occurs in numerous veinlets, seldom more than 3 in. thick, which traverse the rock in all directions.

ORDINARY corrugated iron receives one coat of paint at the rolling-mill, the paint usually employed being red oxide of iron thoroughly ground in pure linseed oil, with enough drier mixed in to give it proper drying quality. The first coat of paint is applied by machine, and likely to be imperfect, wherefore the sheets should be painted again after putting them on the building.

TWENTY-FIVE years ago Lord Kelvin summarized the stores of energy from which mechanical effects can be drawn by man as follows:

1. The food of animals.
2. Natural heat.
3. Solid matter found in elevated positions.
4. The natural motions of air and water.
5. Natural combustibles.
6. Artificial combustibles.

The quarter century which has elapsed since the foregoing summary was announced has not made it possible to extend this list.

A OWNS a mining claim of which B is in possession under an option to purchase, such option being silent as to assessment work. B, while in possession under the bond or option, performs work on the claim to the value of $700. Will such work enure to the benefit of the owner and be counted as assessment work?

Yes. B has the equitable title to the ground, and anything he does toward its development or protection would enure to the benefit of A if B failed to complete purchase.

A OWNS a mining claim. B, a creditor, obtained a judgment against him, levied upon the property, and it has been sold at sheriff's sale. During the redemption period may B perform the assessment work, so as to prevent the re-location of the claim?

Yes. Assessment work may be done by either A or B; and it will enure to the benefit of A, if he redeems, and of B, if there is no redemption. During the period of redemption B holds the equitable title, and may take all steps necessary to protect the property. As to whether in the event B does the work and A subsequently redeems, B could compel A to re-imburse him for the work done, is another and doubtful question.

A LOCATES a quartz mining claim across patented placer ground. He makes a discovery outside the placer boundaries. The vein on its course enters the placer claim. It is asked if he may follow the vein on its *course* underneath the placer surface from his workings outside.

If the lode was known to exist within the placer boundaries prior to the application for placer patent, he may so follow it. If its existence became known subsequent to the patent application, he cannot follow it, as so much of such vein as is within the placer boundaries belongs to the placer patentee. As to whether A might follow the vein on its downward course, underneath the placer, is a distinct question—not asked—and which cannot be answered without further information as to precise position of the apex of the vein within the lode location-boundaries.

WHILE the laws governing the occurrence of ground water in unconsolidated materials and in porous sedimentary formations are now generally understood, little has been written concerning the sources of supply for wells in the so-called crystalline rocks. The most favorable points for water are at the intersection of two or more of the joint systems, the circulation being often concentrated at these points. It is impossible to foretell the success or yield of a well in crystalline rocks, but the chances of a moderate supply are at least as good as 9 in 10. The character of the water obtained is in general excellent, both for domestic and manufacturing purposes, and is usually soft. Hills and places where the soil is thick are the most desirable locations for drilled wells. In general it is better to abandon a well and seek a new location if not successful when a depth of 250 ft. has been reached, as the possibilities of a supply below this depth are much less than at shallower depths. The average cost of 123 wells, averaging 108 ft. in depth and yielding a mean of 12.7 gal. per min., is $4.25 per foot.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Comparative Tests Between Coke and Crude Oil for Melting Precipitate.

The Editor:

Sir—It may interest your readers to know that two experiments were made at the Butters Salvador mines, in Salvador, to determine the relative efficiency of coke and crude oil in melting precipitate from the cyanide plant; the first was on the ordinary San Sebastian clean-up from the acid refining box, and the other was on silver precipitate from Divisadero. The costs are calculated on a basis of coke at $0.0208 (gold) per lb., and oil at $0.252 (gold) per gal. laid down at San Sebastian; white labor at $3 per shift of 10 hours; and compressed air at 1c. per hour.

FIRST TEST.

OIL. Sept. 11, 1906.		COKE. Sept. 13, 1906.	
Precipitate	2,448 oz. Troy	Precipitate	1,991 oz. Troy
Oil	15.2 gal.	Coke	221 lb.
Time	7½ hr.	Time	8¼ hr.
Cost of fuel per oz. of precipitate	$0.00156	Cost of fuel per oz. of precipitate	$0.00231
Cost of fuel per 1,000 oz. of precipitate	1.56	Cost of fuel per 1,000 oz. of precipitate	2.31
Cost of white labor per 1,000 oz. of precipitate	0.91	Cost of white labor per 1,000 oz. of precipitate	1.25
Cost of air per 1,000 oz. of precipitate	0.03		
Total	$2.50	Total	$3.56
Balance in favor of oil per 1,000 oz. of precipitate	1.06		
Total	$3.56		

SECOND TEST.

OIL. Sept. 20, 1906.		COKE. Sept. 21, 1906.	
Precipitate	5,664 oz. Troy	Precipitate	3,524 oz. Troy
Oil	21 gal.	Coke	283 lb.
Time	10½ hr.	Time	10⅙ hr.
Cost of fuel per oz. of precipitate	$0.00093	Cost of fuel per oz. of precipitate	$0.00167
Cost of fuel per 1,000 oz. of precipitate	0.93	Cost of fuel per 1,000 oz. of precipitate	1.67
Cost of white labor per 1,000 oz. of precipitate	0.55	Cost of white labor per 1,000 oz. of precipitate	0.86
Cost of air per 1,000 oz. of precipitate	0.02		
Total	$1.50	Total	$2.53
Balance in favor of oil per 1,000 oz. of precipitate	1.03		
Total	$2.53		

Thus, in both these tests, on entirely different classes of material, we get a uniform result, which shows strongly in favor of the crude-oil method of melting, at least as far as the Republic of Salvador is concerned. There are other advantages connected with the use of oil which do not appear above, but which should not be overlooked. Firstly, the elimination of a by-product in the shape of coke ashes from the wind furnace; and secondly, a great saving in labor and personal discomfort to the man who does the melting, which is a point of some importance in a tropical climate.

E. M. HAMILTON.

San Sebastian, Salvador, October 22.

A Curious Occurrence of Copper.

The Editor:

Sir—A copper prospect discovered this summer near the head of Kasaan bay, Prince of Wales island, Alaska, presents some unique features which may be of interest to your readers. The outcrop occupies an irregular 'hump' some 50 yards in diameter, rising 25 or 30 ft. above the surrounding country. On the surface this hump looked like an ordinary mass of granular diabase, merging in places into a peridotite. There was no iron rust noticeable, nor any other mineral stain indicating ore beneath, but on breaking into the diabase it was found to be flecked with bornite. At a depth of three or four feet splendid specimens of solid bornite were found, and the rock was permeated with green carbonate stain. Pyrite and chalcopyrite seem to be wholly absent at the depth so far attained. A sample of hornblende and bornite assayed $8.20 in gold, with a copper content of 2½%. There are none of the usual gangue minerals formed by alteration of the country rock by mineral solutions. There is no vein, fault, or shear-zone, nor any contact with another formation that can be discovered on the surface. It is up to the economic geologist to tell us how it happened.

W. W. RUSH.

Ketchikan, Alaska, November 3.

Who Is a Mining Engineer?

The Editor:

Sir—A contribution in your issue of October 27, under the foregoing caption, looks to me like the re-opening of a discussion which occurred a few years ago between myself and another who criticised the use of the letters E. M. annexed to my name in a newspaper card.

It is not my purpose to defend my use of the abbreviation in question. That usage now seems to me to have been somewhat ill-advised and amateurish. It is true that I had graduated from a practical mining school of excellent standing, and had supplemented the knowledge there gained with a correspondence course in metal mining; I was familiar with the use of instruments, had a fair insight into mining geology, and could make assays and qualitative determinations. But I had not presided over the operations of any mine, and my standing was not, therefore, properly defined by the term 'mining engineer.' The crux of the discussion, however, lay in the claim made by my opponent that the use of the letters E. M. is permissible only to one who has taken a college degree. This contention I excepted then, as I do now.

While I find fault with no college man for being jealous of whatever distinction he may have acquired in the way of titles, I think there is such a thing as being overpunctilious about non-essentials. It seems preposterous, and a trifle caddish, that college men should arrogate to themselves a monopoly of the letters of an authorized abbreviation. But perhaps the more uncouth of us may yet be entertained with a monograph on 'The Etiquette of Engineering.'

Permit me to subscribe myself, with, I trust, becoming modesty, merely

A STUDENT OF MINING.

Redding, Cal., November 3.

The Editor:

Sir—I have been reading, with much interest, the discussion going on of late in the columns of your valuable journal referring to that much mooted question of 'Who is a mining engineer?' In pondering over what I have read, in the discussions mentioned, it seems to me this question should be changed to read thus: 'What are the duties of a mining engineer?' After settling this latter point, the answer to the former question would manifestly be: He who is skilled and proficient in the prescribed duties of a mining engineer.

Personally I have for many years thought that the term 'mining engineer,' like the term 'mining,' is generally used altogether in too broad a sense, and to embody in its functions requirements that are often foreign to mining, and to embrace duties which should not be included in the profession. According to my way of looking at the question of 'What are the duties of a mining engineer?' I should say his first duty is to attend strictly to the business of operating underground or surface mines along the lines of the best-known economy and up-to-date methods. And in this vocation, if the would-be engineer happens to be a manager or superintendent of a large

mine, in order to merit the name 'mining engineer,' he should be competent to fill the position of any man working under him, from common miner to surveyor, assayer, chemist, geologist, mechanical engineer; and more, he should be competent both from practical experience and education to intelligently and effectively direct each and every one of his subordinates in their respective duties.

I may be accused of having imposed rather too much upon the duties of the would-be mining engineer. Well then, if such accusations follow, I would suggest that if the man who is most likely to find himself weak in these requirements, would be properly called a mining engineer, he had better leave the smelting centres, or the locality of other ore reduction works and buy a ticket to some live mining camp where the duties of a mining engineer can be learnt and become a student of the things he ought to know, let other business alone, and confine himself strictly to mining pursuits, then he may hope to become proficient in the duties of a mining engineer as above prescribed. My conclusion therefore is: Any man whose efficiency and proficiency in mining practice and mining technology can fully meet these requirements anywhere and everywhere, is, in the strictest sense of the term, a mining engineer. But no matter how old or how young he may be in the business, how much or how little education he may have, or from what school, or no school, he may be a graduate, he is not a mining engineer if he is not equal to all this and more.

G. W. MILLER.

Denver, November 5, 1906.

The Editor:

Sir—In the current discussion on this subject your correspondents have supplied an abundance of comment, criticism and comparisons of excellent quality, which, if prone to dwell on the threadbare idea of a union of theory and practice, technical knowledge and common sense, are illuminating and interesting. It seems to me, however, that in their enthusiastic support of this idea, nearly all your contributors have been led to expect too much of a degree or professional title. In nearly every case, the definition given makes a 'mining engineer' a paragon of ability and rectitude, whereas, as pointed out by Mr. G. C. Hewett, in your issue of October 6, there are bound to be more or less incapable men, and dishonest men, to whom the title cannot be denied. Why then expect the title, whether conferred as a degree or assumed by self-educated men, to tell us if a man is worthy to bear it? Very few, if any, titles are so descriptive.

It seems entirely practicable for a degree to certify to a given proficiency in the occupations whose basis is in greater part academical, such as a professor of the classics, or even a chemist, but such can never be the case for a profession like that of mining engineering of which an integral part is business experience and a broad understanding of human relationships. As soon could we expect that the diploma of a business college would stamp the graduate as a 'business man,' or that a title of 'financier' could with sharp-drawn lines be applied to the few who are entitled to this broad, yet in a real sense, distinctive designation.

The real need seems to be for a differentiation of titles for the technically educated and graduated mining engineer, and for the man who is engaged in the profession without that aid. 'Mining Engineer,' in your issue of October 27, has been the first to make a suggestion along this line, but is not his plan of having the initials 'E. M.' designate a college man, and the words 'Mining Engineer' one who has had experience whether from a college or not, too arbitrary and too much in need of an accompanying explanation to gain favor, especially considering the long-established use of both these terms in other ways?

I submit that such a designation should be self-explanatory, and with this in mind, propose that college men shall sign themselves 'Graduate Mining Engineer,' or in abbreviation, 'Grad. E. M.' This leaves the term 'Mining Engineer' for the use of such as choose to apply it, but none could use the other without deliberate false intent, unless they were really graduates. It is true that this might include those who had taken a six-weeks' course in assaying, and had been 'graduated' from the institution giving it, but such mis-applications can never be prevented until all the men are honest, or we have not only a pure-food but a pure-man law, requiring each to be truthfully labeled.

Given the co-operation of alumni of recognized schools of mines, the authorities of these schools, and the engineering societies, this appellation could be made distinctive and valuable, and its use would imply no disparagement to the many superior men who could not qualify for a share in it. It is short, euphonious, unpresumptive, distinctive, equally suited to the young graduate and the alumnus of '75 (whom it is not practicable, as before pointed out, to differentiate by titles), and I believe would serve a useful purpose.

WM. MAGENAU.

Gomez Palacio, Mexico, November 14.

The Editor:

Sir—Whence "the divinity which doth hedge" a mining engineer—that he is not to be rated by the same standards as engineers in other lines and judged by the same tribunal?

Whether the above fragment from Shakespeare has been correctly quoted or not, I make no doubt that it will recall to the mind of every reader of this journal their first thought, namely: Who else can be a reliable mining engineer except the man who possesses the knowledge, both technical and practical, necessary to fit him for the profession? And who but those who *hire* the services of mining engineers are to decide whether he has or has not that knowledge? No more do I doubt that a majority of the readers are of my own mind regarding the author of the 'Viator' letter. Viator may have traveled up and down the world, and have a perfect right to assume such a *nom de plume*, but it seems that few, if any, of the most important facts of mining history ever came within the range of his observation or hearing, else he never would have voiced the opinion that only those who have first received a college or mining school diploma can ever become mining engineers—'the real thing.' It occurs to me that our friend Viator has some ideas in common with the element I have already spoken of, and both he and they might be better qualified to give opinions on 'mining engineers' if they would only post themselves concerning the 'doings' of some of the 'big gun' mining engineers of both present and past.

Can anybody give a sensible reason why there should not be good, bad, and indifferent mining engineers, just as there are bad plumbers, worse plumbers, and plumbers whose degree the English language furnishes no fitting term for—'road agent' being the nearest approach to it?

"By their fruits ye shall know them" is a precept that has stood the wear and tear of many centuries. This principle has been the rule by which the true worth of mankind has been gauged since the dawn of creation and will remain so until the end of time. It has no rewards for the unworthy. It applies to bricklayer and mining engineer alike—without favor or discrimination.

I take it for granted that anyone who has some understanding of the mining business believes that a man who first receives a thorough technical education and then a

thorough practical one afterward should, and often does, make the best mining engineer, but in a great majority of cases he is a lamentable failure—simply because he has not brains enough to know that his technical schooling only makes it easier for him to *learn* to be a mining engineer than if he had no such rudimentary training.

The last article I read in the discussion was that of Edward W. Ralph in your issue of October 13, and I believe it commends itself to all as being unanswerable. In the preceding issue George J. Bancroft defines a "mining engineer as being a man skilled in all the principles and in all the practices of the mining business." According to such a definition there are no mining engineers—"no pole long enough to reach the persimmons." I rather suspect Mr. Bancroft of joking, but if he really means it, then he has taken an extremely radical position, and an altogether untenable one, for no part of the mining business has yet been reduced to an exact science—no engineer has yet reached the ultimate in any branch of it—nor can any man, in one lifetime, be sufficiently "skilled" in all the branches to warrant him in thinking that he knows all there is worth knowing about it.



Movable Distributor Vat Being Discharged Into End Vat, for Percolation.

Whatever may be the purpose back of the question which is the subject of this discussion, it should be considered on its merits alone, if considered at all, because there are too many intelligent mining men entitled to a say as to who are real mining engineers to permit any guild of the profession to bar from it all or any competent man simply because he did not happen to be fortunate enough to build on the guild's prescribed foundation. Let us choose but one illustration: Who will dispute the late Marcus Daly's right to the title of 'mining engineer?' Although he did not have the advantage of a preparatory college course, what mining engineer of the college type ever equalled his achievements?

"A fair field and no favor" is all that is asked by the man who has gained his knowledge of the mining business by hard knocks in the practical field. If he has not had time or opportunity to properly equip himself with the necessary technical part he can *hire* that, just as 95% of the mining school graduates have to do with regard to the practical part.

E. E. WANN.

Kingstone Mountain, Cal., October 30.

[This discussion is now closed. It is reviewed at length on a preceding page.—Editor.]

A Distributor Vat.

To Mr. Gerald Browne we owe the accompanying illustrations of a movable distributor vat in a cyanide plant at the Sons of Gwalia mine, Western Australia. These distributor vats run on three rails and are moved by a windlass-handle on a worm-gear arrangement connected with one three-wheel axle. Two men can move a vat either full or empty, and in this way it can be filled or discharged above any vat required. There are two lines of vats and two movable distributors. When one is filled it is dried by the vacuum-pump in the usual way and the material is discharged—ready for percolation and well aired—into any vat below. The simplicity of the arrangement is obvious.

The Mineral Output of Ontario.

The Bureau of Mines has just issued a statement of the output of the metalliferous mines and works of the Province for the nine months ended September 30, as follows:

	Quantity.	Value.
Gold, oz.	2,015	834,377
Silver, oz.	2,542,827	1,609,564
Cobalt, tons	138	110,400
Nickel, tons	8,037	2,856,233
Copper, tons	3,900	600,000
Iron ore, tons	93,159	117,466
Pig iron, tons	208,094	3,194,206
Steel, tons	123,257	3,059,070
Zinc, tons	300	4,500
Arsenic, tons	691	13,830

All the silver, cobalt, and arsenic came from the Cobalt district, the two latter items being to some extent estimated. The nickel and copper came principally from Sudbury, and the iron ore from the Helen mine, Michipicoten. This is reckoned over again in the items of pig iron and steel, which also include imported raw material. The Cobalt ore mined, but not shipped, during the period covered by the returns, amounting to 893 tons, is not included.



Movable Distributor, Unfinished.

KUNTZITE is a beautiful variety of spodumene that is much prized as a gem stone. In color it has a unique peach-blossom tint, and also possesses great brilliancy. These are its only recommendations, for it is not hard enough to wear well and has a well-marked cleavage. The value of such gemstones depends almost entirely on fashion and it is accordingly a variable quantity. San Diego county produces this beautiful mineral, where it occurs associated with tourmaline and lepidolite, a lithia mica.

Three Weeks in Mexico.---XII.

The Chemistry of the Patio Process.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The *patio* has been used on a large scale and continuously since 1557, therefore it is probable that a great many have attempted, at various times, to investigate the process; nevertheless, few have been bold enough to publish the results of their investigations. In offering a few notes, it is with the hope, mainly, of helping the younger students in our profession.

The right amount of bluestone[1] is important, for if it be insufficient, the copper sulphate is converted into the sub-oxide, which reacts on the mercury so as to sicken it, covering it with a film. The bluestone consists of the sulphate of iron as well as copper, for it is formed by the roasting of chalcopyrite; these sulphates react on the sodium chloride so as to liberate hydrochloric acid, upon the silver mineral, transforming it to a chloride. A subsequent reaction with the hydrated oxides liberates the silver and hands it over to the mercury, for amalgamation. The copper sulphate acts as a carrier of oxygen and the presence of it is important to preserve the mercury in a metallic state.

The old theory, to be found in most text-books, was that after the cupric chloride was formed, a reaction with the silver sulphide mineral, in the presence of air, yielded cuprous chloride and argentic chloride, the argentic chloride coming in contact with the mercury, so as to form an amalgam, together with mercurous chloride, thus:

(1) $CuSO_4 + 2NaCl = CuCl_2 + Na_2SO_4$
(2) $2CuCl_2 + Ag_2S = 2AgCl + Cu_2Cl_2 + S$
(3) $2Ag_2S + 4Cu_2Cl_2 + 6O = 4AgCl + 2(CuCl_2 + 3CuO) + 2S$
(4) $2AgCl + 3Hg = Hg_2Cl_2 + Ag_2Hg$.

It is a complex bit of chemistry, rendered obscure by the lack of accurate data. The *patio* process is rarely



The Patio Process. Mules Mixing the Charge.

which, according to Ortega,[2] first forms cupric chloride and then, in the presence of mercury, cuprous chloride and mercurous chloride. The cuprous chloride absorbs oxygen and then reduces the silver sulphide in the ore, with the formation of mercuric sulphate and the liberation of the silver. Thus:

$2NaCl + CuSO_4 = Na_2SO_4 + CuCl_2$
$CuCl_2 + Hg = CuCl + HgCl$
$CuCl + 4O + Hg + Ag_2S = CuCl + HgSO_4 + 2Ag$

On being liberated, the silver immediately forms an amalgam with the excess of mercury.

On the other hand Bustamente[3] claims that the iron sulphate in the *magistral* is essential, the role of the copper being, in many respects, subordinate, although necessary, to the iron. According to his explanation, ferric chloride is formed; this, on being reduced to a lower chloride, releases chlorine, which, while nascent, acts checked by systematic analyses and assays, so that, despite the three centuries and a half during which it has been used in Mexico, there is but little evidence available. One or two points stand out clearly. If silver chloride be formed directly from the action of the chlorine liberated from the salt, and if this be a necessary chemical stage, why is it that ore containing hornsilver or natural silver chloride cannot be treated successfully by this method? If copper sulphate be the sole active agent in the *magistral*, why is it that the pure copper sulphate gives such poor results? If there is no direct chlorination of the silver, why is so much salt required? The first two queries have been answered; the last can be explained on the ground that the brine serves as a solvent for the cuprous chloride, rendering it more active as a carrier of oxygen.

Humboldt makes several interesting observations[4] on the process of amalgamation in the *patio*, as carried out during his visit to Mexico, a hundred years ago:

"The process invented by the miner of Pachuca is one

[1] *Magistral*, an impure mixture of copper and iron sulphate was formerly employed. Bluestone, commercial copper sulphate, has replaced it in practice.

[2] 'The Patio Process for Amalgamation of Silver Ores,' by Manuel Valerio Ortega. *Trans.* Amer. Inst. Min. Eng., Vol. XXXII, pp. 279-282.

[3] 'A Study of Amalgamation Methods, etc.,' by Miguel Bustamente, Jr. *Trans.* Amer. Inst. Min. Eng., Vol. XXXII, p. 489.

[4] 'Political Essay on the Kingdom of New Spain.' Black's translation. Vol. III. Book IV. p. 268.

of those chemical operations, which for centuries have been practised with a certain degree of success, notwithstanding the persons who extract silver from minerals by means of mercury, have not the smallest acquaintance either of the nature of the substances employed, or the particular mode of their action. The *azogueros* (or amalgamators) speak of a mass of minerals as of an organized body, of which they augment or diminish the natural heat. Like physicians who in ages of barbarism, divided all ailments and all remedies into two classes, hot and cold, the *azogueros* see nothing in minerals, but substances which must be heated by sulphates if they are too cold, or cooled by alkalies if too warm. The custom which was already introduced in the time of Pliny, of rubbing metals with salt, before applying the amalgam of gold, has undoubtedly given rise to the use of muriate of soda in the process of Mexican amalgamation. This salt, according to the accounts of the *azogueros*, serves to clean and to unskin the silver, which is enveloped with sulphur, arsenic, and antimony, as with a skin (*tililla* or *capuz*), whose presence prevents the immediate contact of the silver with the mercury. The action of this last metal is rendered more energetic by the sulphates with which the mass is heated; and it is even probable that Medina only employed simultaneously the sulphate of iron and copper and the muriate of soda, because he discovered in these first attempts, that salt was only favorable to the process in the minerals which contained decomposed pyrites. Without having any clear idea of the action of the sulphates on the muriate of soda, he endevored to recompense (*refaire*) the minerals, that is, to add *magistral*, to those which the miner considers as not vitriolic."

The 'hot' and 'cold' condition—called *calentura*, or fever, and *frio*,—are untechnical references to oxidation and reduction, the sulphates contributing oxygen as fuel to the chemical reactions while the alkali of the lime, ashes, or cement copper employed to doctor a 'hot' *torta*, neutralizes any excess of acid sulphate. The idea that the silver of the argentite was coated with sulphur, which had to be removed to permit of contact with mercury, illustrates the ignorance of what constitutes a chemical compound. The sodium sulphate is formed by the reaction between the "muriate of soda" or common salt and the copper sulphate, so that the addition of it simply anticipated a reaction which would follow from the use of *magistral* and the mention of "decomposed pyrites" suggests the agency of iron sulphate in the *patio* process, an agency the exact working of which is yet a subject for debate among metallurgists.

Further on, he explains how, by the leaden look of the mercury they inferred the commencement of chemical action; when a fine gray powder is separated from it which sticks to the fingers, they say the paste is too 'hot' and they 'cool' it by adding lime. If it preserves its metallic lustre, or is covered with a reddish pellicle or film, if it does not appear to act upon the mass, the amalgamation is considered too 'cold' and they endeavor to 'heat' it (*calentar*) by mixing *magistral*.

The "leaden look of the mercury" is due to excess of copper sulphate, with formation of flouring mercuric chloride, which, in presence of sunlight and organic matter (such as the droppings of the horses or mules that trample the *torta*), is converted into oxide; this is almost insoluble in the brine, formed by the excess of salt, and in consequence it is apt to be lost in the *torta* when it is finally discharged after treatment. When the *torta* is cold, the mercury is apt to show 'flouring;' it is in minute globules that do not coalesce, being coated with a reddish film of copper sub-oxide, because there is not enough of the copper sulphate present to generate chlorine from the salt, so as to form cuprous chloride.

At first the charge was mixed by the treading of a number of bare-footed workmen, but in 1783 Juan Comejo brought, from Peru, the idea of using mules and the Government granted him a privilege for it. This decreased the expenses of the process by one quarter.

Then Humboldt continues: "It has been long proposed to cover the surface on which the pastes repose with plates of iron and copper instead of flags; and it has been endeavored to stir the mass by working it with ploughs of which the share and coulter should be made of the metals mentioned, but the mules suffered too much from this work, the *schlich* (slime) forming a thick and by no means ductile paste." Finally, he concludes: "The process invented by Medina possesses the great advantage of simplicity; it requires no construction of edifices, no combustibles, no machines, and almost no impelling force. With mercury and a few mules to move the arastras, we may, by means of amalgamation *por patio*, extract the silver from all the meagre minerals near the pit from which they are taken in the midst of a desert, provided the surface be sufficiently smooth to admit of the establishment of the *tortas;* but this process has also the great disadvantage of being slow and causing an enormous waste of mercury."

How great this waste of mercury was, it is difficult to realize today when the old tailing has been washed by several generations of patient *peones*, or else scattered abroad by the torrential rains of the tropics and the dry wind of the high plateau. They used eight parts of mercury to one of silver. At El Oro the mill with 100 stamps was run for six years without the purchase of a single flask of quicksilver. The tailing heap of the old *hacienda*—built 30 years ago—gave all the mercury wanted. In cyaniding the tailing, the mercury was dissolved, to be precipitated in the zinc-boxes with the gold. The precipitate was retorted in order to drive off the water and the quicksilver. Out of a retort of 1,000 lb. there would be obtained 150 lb., or two flasks of quicksilver. Another suggestive incident may be mentioned. Nearly two years ago, when the mechanical ploughs (*repasadoras*) were installed at the Loreto mill, a cement floor was laid down, and in excavating for this purpose a big find of quicksilver was made, the earth being saturated with it. It is said that mercury worth more than 30,000 pesos was obtained.

As Humboldt said, the *patio* was successful despite the ignorance of any chemical reactions involved. It is only recently, when the process is being discarded for more effective methods, that the chemistry of it has been investigated intelligently. As used for 350 years it was an empirical process, regulated by the experience obtained with the particular ores of each district.

The *patio* was invented when men, horses, and time were cheap, when there was no haste to realize on the ore in the mine. And this spirit survives; when I asked one of the Mexican engineers why they did not exploit a certain rich mine on a larger scale, he said that the shareholders did not care to rush the production because they feared the mine might be worked out too soon. This is the European idea of fifty years ago; the opposite of it is the American notion that it is best to gut a mine expeditiously and make the maximum money in the minimum time. Both extremes are extravagant.

NOTHING great in science has ever been done by men, whatever their powers, in whom the divine afflatus of the truthseeker was wanting. Men of moderate capacity have done great things because it animated them; and men of great natural gifts have failed, absolutely or relatively, because they lacked this one thing needful.

Ventilation in Deep Mines.

In a recent letter from our Melbourne correspondent, reference was made to the enquiry into the ventilation of the deep mines at Bendigo. A careful investigation was made by Mr. Walter Summons, a physician, the cost being defrayed by the trustees of one of the late owners of *The Argus*, the leading newspaper of Australia. The workings examined varied in depth from 885 ft. to 4,236 ft. Tabulated, some of the data were:

Mine	Depth—Feet	Height—Feet	Temperature Degrees F.	Water Vapor Per Cent.	Carbon Dioxide Per Cent.
Suffolk. Plat	1,674		68	95	—
" Raise		70	85	97	0.465
Lansell's 180. Plat	3,300		82	95	
Victoria Quartz. Plat	4,010		75	98	
" " Bottom of shaft	4,254		88	94	0.212
New Chum Railway. Plat	3,856		92	97	0.139
" " " Bottom of shaft	4,236		95	99	0.203

During the period devoted to the investigation, from midsummer to the depth of winter, the temperature at surface varied 40°, but that of the mines was practically unchanged. In the Suffolk, the use of a spray of water and air, at high pressure, through an atomizer, decreased the carbon dioxide from 0.465 to 0.165% within three hours, the temperature falling from 88 to 77°. In sinking the New Chum Railway shaft the conditions became so oppressive that the men were expected to work on six-hour shifts. At the West Berry Consols, an alluvial (deep lead) mine, the air at a depth of 420 ft. showed 0.524% CO_2 at the plat. Ventilation is promoted by a pair of No. 4 Root blowers. The workings are wet and there is no dust, the large quantity of carbon dioxide being due to organic matter in the gravel. Mr. Summons emphasizes the bad conditions accompanying work in raises; as the holes are drilled upward, the men work in a cloud of dust, and the only ventilation is from the exhaust air of the drill. A jet of air or a water spray both ameliorated the worst conditions. In the deepest mines, ventilation is sadly defective. For example, in the New Chum Railway, air from the 3,856-ft. plat contained 0.139% of carbonic acid, while a sample from the bottom of the shaft, 4,236 ft. down, showed 0.203%. These are the only two places in the mine where the men are at present working. "In this mine during my visit," writes Mr. Summons, "the men went down for eight hours, but only worked in the shaft 30 minutes at a time, while the second pair were 'cooling' in the plat. Since then they have worked in shifts of only six hours. Examination of the men in the 3,856-ft. plat, at 'crib' time (after resting), showed their pulse rate per minute to be 88, 92, 96, 104, 108, 108, 112, and their temperature to be 101°, 100.7°, 100.5°, 100°, 99.2°, while my own rose from 98.4° to 99.5 in 30 minutes, taking no exercise whatever in that time. Here the ground was wet, and the air practically saturated with watery vapor, while the temperature of the plat was 90°, and that of the bottom of the shaft was 95°. One great redeeming feature of this mine is the absence of dust. The men were sallow and sickly looking; while, from out of the few men employed in it during my six months' investigation, I examined two, and both were tuberculous, their sputum teeming with tubercle bacilli. In this case neglect of carrying down winzes along with the shaft has had, no doubt, a good deal to do with the defective ventilation, and now it is the intention to sink the shaft 4,300 ft.—that is, nearly 450 ft. from the plat—before another cross-cut is driven. In the Hercules and Energetic mine the amount of carbonic acid in a drift at a depth of 480 ft., and 200 ft. from the shaft, was found to be 0.35%, and in the intermediate, 500-ft. level—not directly connected with the shaft—the percentage was 0.46. In this latter level the men were accustomed to have their crib, and much waste food was carelessly thrown about, even though the manager had provided a box for it. The bread was mouldy and rotten, giving a musty sickening odor to the place. The large percentage of carbonic acid gas resulted to a certain extent from the decaying matter, but to a greater degree was due to insufficient ventilation."

Mr. Summons states that the solid matter that constitutes the dust consists of minute particles of quartz, arising from the breaking of ore. In winzes, raises, and dead ends generally the dust is worst. It ranges from 560,000 to 800,000 particles per cubic centimetre. While the air of large cities contains dust, it is only breathed for a short time, at intervals, whereas the miners breathe it during a whole shift of eight hours. Another distinction is to be found in the character of the dust. In cities it is the carbonaceous matter from chimneys and the like, which is almost inert when breathed; whereas the dust in a quartz mine is hard silica with jagged edges that cut the tissue of the lungs, producing fibrosis. On the Rand they call it 'silicosis.' It induces tuberculosis, and on this subject Mr. Summons was also emphatic, for he lays stress on the danger to the workmen of their breathing the air of those thus afflicted.

The temperature of these deep mines is naturally high. It increases one degree for every 70 ft. of additional depth. The highest reading was obtained from water issuing from a crevice in the Victoria Quartz mine, at 4,200 ft. below surface, or 3,700 ft. below sea-level, where the thermometer registered 114° F. Heat is derived from the result of chemical action due to (*a*) the persons present, (*b*) light and explosives, (*c*) the exposed rock surfaces, and (*d*) the compression of the air as it descends the shaft, through increase in the barometric pressure. Though the temperature of the deep mines is higher than that of the shallower ones, exceptions are found, especially where the shaft is downcast and the air has not been in contact with the rock sufficiently long for a mean temperature to be attained. Nevertheless, where the air has traveled some distance in and around the workings a stationary temperature is reached, this being clearly shown in the case of the Victoria Quartz and Lansell's 180 mine. After pointing out that at deep levels air fresh from the surface has a powerful cooling effect, Mr. Summons draws attention to the fact that in time a point is reached when the gain and loss counterbalance one another. To the temperature and the humidity combined is due the languor felt by the men at work, and also the inability to perform sustained work.

In the saturated air the miners perspire continuously, but the perspiration does not evaporate, so the skin is always moist. This is not healthy and it causes the body temperature to rise. The men have a feeling of exhaustion and discomfort even when not engaged in hard work. From an economic point of view, it is a mistake to perform labor under such conditions. No additional wage should carry weight, for, apart from the inhumanity of it, such a concession does not meet the problem, which will become increasingly burdensome as the mines are deepened. "It is not knowledge," says Mr. Summons, "but performance that will rectify matters." As the properties at Bendigo are extremely small, it is impracticable to sink two shafts, but connections can be made with adjoining mines, and winzes should be sunk as the shaft is going down, with connections through cross-cuts at regular intervals of not less than 100 ft. These will not be without value in prospecting the ground between the larger saddles. In raises, the box or three-compartment system should be employed, and in dead ends the air-jet machine ought to be used.

Methods of Mining at Ely, Nevada.

Written for the MINING AND SCIENTIFIC PRESS
By C. EVERARD ARNOLD.

On account of the low content of the ore in the Nevada Consolidated Copper Co.'s property, it is imperative that the ore shall be mined and treated in large quantities and at the lowest possible cost, in order to ensure profitable working.

The white porphyritic rock which carries the copper is fortunately very much decomposed, soft, and easily mined, and in accordance with the opinion of J. Parke Channing (who reported on the company's holdings) that the methods of mining employed in working the wide hematite deposits of the Mesabi Range could not be successfully applied here, the company has decided to follow the scheme used by the Oliver Iron Mining Co. in their Pioneer mine at Ely, Minnesota. This scheme, of which a description is given later on, is being carried out under the supervision of Capt. Richard Toms, who, for many years, was mine captain at the Chandler and Pioneer properties.

As regards the present state of mine development, all operations have ceased at the Eureka property (which lies six miles west of Ely), and on account of the soft nature, width, and proximity to the surface of the orebody, it is extremely probable that steam-shovels will be employed in mining it. At the Ruth mine (which is 1¼ miles east of the Eureka mine) all energies are being put forward to connect the Ruth shaft with the new Star-Pointer shaft. The Ruth shaft pitches north at an angle of 42°, and the connection is being made by means of a level running west, started at a depth of 500 ft. on the incline. This level has been driven through 950 ft., and after having gone 2,300 ft. it is expected to tap the Star-Pointer shaft, which is vertical, at a depth of 342 ft. A plan of a timber set for this shaft is shown in Fig. 1; the shaft has been sunk 230 ft., striking the orebody at a depth of 150 ft. All drilling is done by hand, and working three eight-hour shifts with five men per shift, the shaft was sunk and timbered 72 ft. during the month of September, all broken rock being hoisted after every round before drilling was re-commenced. No water has been encountered as yet either in this shaft or in the 500-ft. level of the Ruth.

All the hoisting of ore is to be done through this shaft, which will be equipped with a steel head-frame and substructure, the railroad from the concentrator coming right up to the storage bins which are now in course of erection, their capacity for the present to be 3,742 tons. On a platform above these bins will be erected two No. 7½ Gates gyratory crushers, a 30-in. belt-conveyor distributing the crushed rock into the bins. It will be noticed in Fig. 1 that the shaft has one very large compartment, 5 ft. 6 in. by 6 ft.; this will enable the loaded timber-truck to be run onto the cage, lowered, and run right into the workings, thus avoiding the troubles incidental to lowering heavy timbers when they have to be loaded on the cage at the surface and transferred at the station to the truck.

After connecting the two shafts, a large ore-pocket will be built off the Star-Pointer shaft, under the 500-ft. level, and the level continued on the west side of the shaft far enough for the accommodation of a train of cars. Fig. 2 shows a plan of portion of the proposed workings on the 500-ft. or main level, illustrating the manner in which the orebody is to be divided up into a number of pillars, approximately 50 by 70 ft. each, by the intersections of the drifts and cross-cuts that comprise part of the main level. This level is being cut large enough to allow 8 ft. clear between cap and sill, 6 ft. 2 in. between tops, and 8 ft. between bottoms of posts.

Electric traction is to be used underground and the reason for the number of turns in the drifts and cross-cuts is that the tracks will contain as many stationary switches as possible, and with this arrangement the process of running the ore out to the station will be as follows: Suppose, for example, that there are ore-chutes at *A* and *B*, in front of which is a train of loaded cars;

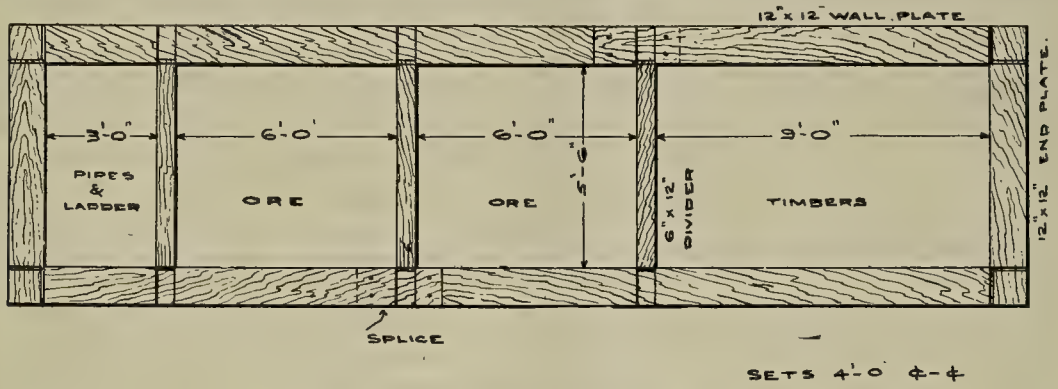


Fig. 1. Plan of Timber-set for Star-Pointer Shaft.

and that a train of empty cars is wanted at chutes *C* and *D*. The locomotive leaves the station with a train of empty cars behind it; running along in the direction indicated by the arrows, it couples onto the train of full cars at chutes *A* and *B*, and still pulling the empty train it pushes the full train ahead along the course shown past chutes *C* and *D*, where the chute-tender uncouples the empty cars from the locomotive. The journey is then continued, the full cars being pushed along and emptied into the pocket at the station. The locomotive next reverses and pulls the now empty cars behind it, being then ready to perform a similar cycle of operations. Thus the empty cars can be run into, and the full cars run out of, the workings without the inconvenience and loss of time which accompany such switching.

After completion of a series of pillars on the main level, vertical raises will be put up in the pillars at intervals of 25 or 30 ft., and after rising 30 ft. a sub-level will be run directly over the course of the main level below. This system of raises and sub-levels will be continued up to the next main level, thus dividing the ground between the two main levels into a system of pillars that are ready to be caved, the raises having been cribbed up and used as chutes. The caving is to be performed by carrying inclined raises, tributary to the vertical raises, from the four sides and into the centre of a pillar, thus rendering possible the caving of a pillar directly above it, the rock being blasted and caved down into the raises, where it will run straight to the chute-gates on the main level.

It will necessarily be some time before this scheme can

be put into running order, but it will doubtless be completed in time to enable the mine to keep the concentrating and smelting plant supplied, which it is estimated will be in operation by May, 1908, its initial capacity to be 5,000 tons daily, with an approximate ultimate capacity of 15,000 tons.

THE HAILE MINE in South Carolina has been worked more or less continuously since about 1830 and during all that time has been one of the most important mines of the region. In early days leases were given on sections 50 ft. square, and open-cuts were made on these claims by slave labor. This was of course disastrous to systematic, economic mining. The upper, oxidized portions of the orebodies were rich and some of them yielded lumps of gold worth from $300 to $500. Except during war time, open cutting was carried on until about 1880, when actual underground mining was begun and continued up to about four years ago. A return to the open-cut system has been made on a much larger scale than formerly. This mine, said to be the only steady dividend-paying gold mine in the Southern Appalachians, owes its success in recent years very largely to the intelligence and persistent efforts of Capt. Adolph Thies, who for nearly 20 years was its manager. Mr. E. A. Thies, his son and the present manager, is following the same policy.—L. C. Graton, U. S. Geological Survey.

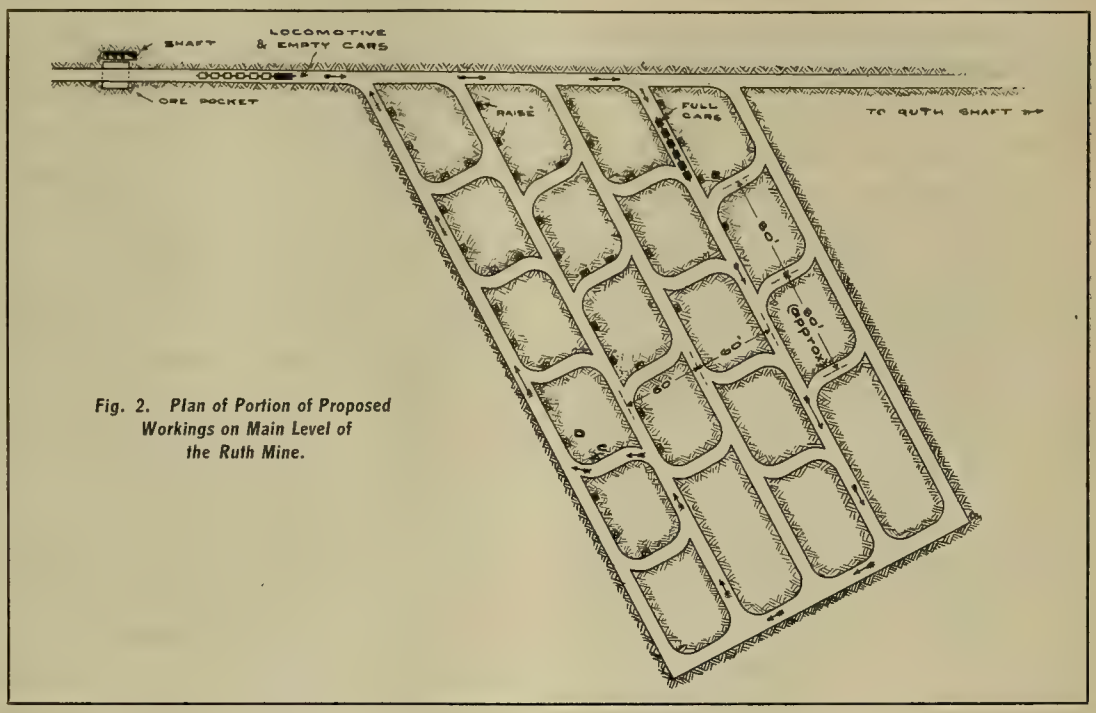


Fig. 2. Plan of Portion of Proposed Workings on Main Level of the Ruth Mine.

THE London Stock Exchange does not, like the New York Exchange, require daily payment for, and delivery of, the stocks bought or sold upon its floor. Such accounts are settled once a fortnight; their settlement occupies three days, respectively known as 'ticket day,' when the names of buyers and sellers are given up, 'account day' or 'contango day,' when provision is made, if desired, to carry a speculative operation over another fortnight, and 'pay day' or 'settlement day,' when accounts are finally adjusted. What London calls the 'carry-over' is effected by payments of a 'contango' or continuation rate, which varies according to the outside discount market, and the account to be carried over.

Korean Mining Laws.

Among the new regulations recently promulgated are the following:

ARTICLE 4. The boundaries of mining claims shall be limited by straight surface lines extending vertically downward. Their area in the case of coal shall not be less than fifty thousand tsubo, and in the case of other minerals not less than five thousand tsubo; and in neither case shall it exceed a million tsubo. The latter limit may, however, be exceeded in case it is absolulely necessary for the protection of public mining interests or for the amalgamation or division of mining claims.

ARTICLE 7. The Minister of Agriculture, Commerce, and Industry shall have the power to refuse permission for mining, in case he considers such a step to be necessary in the public interest or for any other reason.

ARTICLE 10. No mining right may be sold, assigned, or mortgaged without permission of the Minister of Agriculture, Commerce, and Industry. A mining right may be acquired by inheritance.

ARTICLE 21. The Government shall not be responsible for any damage that may be caused by any measure taken by the Minister of Agriculture, Commerce, and Industry by virtue of the present Law or of the Detailed Regulations for carrying it out.

ARTICLE 27. Inasmuch as the measures to be taken under the present Law and the Detailed Regulations for carrying out the same will in many cases concern foreigners, no such measure shall be decided upon or executed without the previous consent of the Residency General. This stipulation shall also apply with regard to the mines belonging to the Imperial Household Department.

ARTICLE 30. Foreigners who have been granted mining rights and have begun operations in connection therewith before the promulgation of the present Law and are still carrying on such operations, shall observe the provisions hereof in so far as they do not conflict with the terms of the grants made to them.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

It is wholly immaterial in which the various steps required to make a valid location of a mining claim are taken, if all such steps are completed before third persons acquire an interest; and a discovery made after staking and record will inure to the benefit of the locator as of the date of the discovery.

Healey *v.* Rupp, (Colo.) 86 Pac. 1015.

The notices required by the statute to be given by an applicant for a patent for a mining claim, are held to be in effect to all adverse claimants, who are thereby required to assert their rights by filing an adverse within the 60 days' publication of the application, and unless such adverse is filed within that time it will be conclusively presumed that none exist.

Healey *v.* Rupp, (Colo.) 86 Pac. 1015.

The dedication of a street to a city does not carry with it the title to or property in mines below the surface; and the grantor or any one purchasing from him may take the ore where the mining does not interfere with the use of the street.

City of Leadville *v.* Colorado Min. Co., (Colo.) 86 Pac. 1034.

City of Leadville *v.* Bohn Min. Co., (Colo.) 86 Pac. 1038.

In a contest by adverse claimants over the discovery and location, in a case recently decided by the Supreme Court of Utah the following propositions and points of law were decided: (1) That a discovery of a vein or lode on unoccupied and unappropriated mineral lands of the United States is a pre-requisite to a valid location of a mining claim. (2) That a location based upon a discovery within the limits of an existing and valid location is void. (3) That what has been located once under the law shall not be re-located until the first location has expired, until the rights of the former owner or locator have come to an end, and until in law he has forfeited or abandoned his claim and left the property open for another to take up. Until such abandonment or forfeiture, the ground is not subject to re-location, for it is essential that at the time of the location the ground located should be a part of the public domain. Hence, a re-location on lands actually covered at the time by another valid and subsisting location is void; and this not only against the prior locator, but all the world, because the law allows no such thing to be done. (4) That when forfeiture has been occasioned the claim or mine upon which such failure occurred shall be open to re-location in the same manner as if no location had ever been made, provided that the original locators their heirs or assigns, or legal representatives, have not resumed work upon the claims after failure and before such location. (5) That a location to be good must be good when made, and that each claimant must stand on his own location and can take only what it will give him under the law. These propositions are readily deducible from sections 2319, 2320, 2322, and 2324, Rev. St. U. S., and are supported by decisions from both Federal and State courts, and by text-writers.

Lockhart *v.* Farrell, (Utah) 86 Pac. 1077

In controversies over mining claims and in adverse proceedings to settle disputed questions of location each party is practically a plaintiff and the burden is on him to show his title. This rule is deduced from the United States statute which provided that if in an adverse suit title to the ground in controversy shall not be established by either party, the jury shall so find, and judgment shall be entered according to the verdict. The object of this statute was said to be, to provide, in the case of a total failure of proof of title for an adjudication, "that neither party was entitled to the property, so that the applicant could not go forward with his proceeding in the Land Office simply because the adverse claimant had failed to make out his case, if he had also failed."

Brown *v.* Curney, 201 U. S. 184.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The sample from Bodie, Cal. marked S. T., is reddish Quartz coated with earthy limonite.

Rocks from V. G. H. of Cripple Creek, Colo. are gray Feldspar-porphyry and black Basalt.

The specimen from W. P. de R. of Coaldale, Nev. is a decomposed volcanic rock. Whether it contains value can only be determined by assay.

The sample from E. J. M. of Pasadena, Cal. is Quartz, with some calcite containing flakes of graphite. The blue crystals on the rock from F. W. P. of Quartzburg, Ida. are Vivianite, the phosphate of iron.

Specimens from Pioneerville, Ida. marked J. M. C. are: No. 1, Rhyolite; No. 2, metamorphosed Rhyolite; No. 3, Mica-diorite; No. 4 and 5, hornblende-biotite Granite; No. 6, Pitchstone; No. 7, Andesite; No. 8, Rhyolite; No. 9, Granite, metamorphosed; No. 10, Rhyolite; No. 11, 12 and 13, altered Rhyolite rocks; No. 14, Granite.

TIN IN SOUTH CAROLINA.—Tin occurs along a narrow belt extending northeastward from the centre of Cherokee county, S. C., across Cleveland and Gaston counties to the centre of Lincoln county, N. C. This belt represents the distribution of pegmatite dikes and in its position is dependent on the general geologic structure of the region. The pegmatite is closely related genetically to the granite and granitic gneiss which occur along this belt and which are sometimes cut by the dikes of pegmatite. Most of the pegmatite bodies are very irregular in extent. Tin is present as the mineral cassiterite, which occurs only as an original or primary constituent of the pegmatite. This mineral is not evenly distributed through the dikes, but is generally segregated or concentrated along certain lines. The orebodies or shoots thus formed generally pitch at a considerable angle and are of small cross-section, but extend indefinitely along the pitch. They are probably irregular in extent, somewhat after the fashion of the dikes in which they occur. The percentage of cassiterite in the ore-shoots may be high in places, but the average value will probably be under five per cent. This ore may be reduced to a concentrate of good quality. The cost of production of the metallic tin ought not to be excessive, but will certainly increase with depth. Placer deposits are unimportant. The necessity of shipping the concentrates to England for reduction is a serious handicap and may prohibit operations which would otherwise be successful. The production of the Carolina tin belt will probably always be very small as compared with the amount of tin consumed in the United States.—L. C. Graton, U. S. Geological Survey.

GARNET SAND is widely distributed throughout California, and occurs in districts altogether barren of valuable mineral, as for instance certain portions of the Coast Range and other sandstone areas. For garnet that has the hardness of the Adirondack mineral, 7.5 to 8, or nearly that of topaz, there is a good demand as an abrasive. The Adirondack garnet occurs in laminated pockets scattered through beds of a compact hornblende-feldspar rock. Sometimes the quality of a garnet may be improved by washing in wide troughs set at a slight angle, using a hoe to mix the sand with rapidly running water. A moderate export business is being done in garnet and garnet paper.

Thermal Activity in its Relation to Veins.

By JAMES PARK.

*Igneous magmas are now admitted by petrologists to contain more or less water, together with many constituents of a hydrous or gaseous character. Hence the fusion of magmas is not believed to be the result of dry heat alone but heat in the presence of water.

According to Arrhenius,[1] water renders the magma more liquid. It has been shown by experiment that magmas which require a temperature of 3,000° F. to produce dry fusion can be fused in the presence of water at 500° F. According to the same distinguished physicist, water in a rock magma acts the part of an acid, liberating free silicic acid and free bases.

The activity of water at high temperatures is very great. Barus[2] has shown that water heated above 185° C. attacks the silicates composing soft glass with remarkable rapidity; and Lemberg has proved experimentally that water at a temperature 210° C. slowly dissolves anhydrous powdered silicates. It is probable that at great depths the pressure will be sufficient to hold the water in the form of a liquid in a superheated condition.[3]

It is well known that during and after volcanic eruptions there are emitted enormous volumes of steam, with hydrogen sulphide, sulphur dioxide, carbon dioxide, as well as compounds of chlorine, fluorine, and boron. These gaseous and aqueous emanations come from the same source as the igneous magma, accompany the magma in its ascent, and may possibly be one of the contributing causes of the eruption.

Volcanic phenomena can be studied in many parts of the world, but perhaps nowhere with more advantage than in New Zealand. In the volcanic region of the North Island there are thousands of square miles in which volcanic activity can be seen in every stage and phase; there are active, intermittent, and extinct volcanoes, besides innumerable geysers, fumaroles, and hot springs, active, decadent, and dead. The active and intermittent volcanoes discharge their lavas and fragmentary matter from single pipes, or from lateral vents apparently connected with the main pipe, and from fissure rents. The volcanic eruption at Rotomahana in 1886 was from a fissure rent over six miles in length.[4] The whole length of the rent was the scene of great activity for some weeks after the first great outburst. The geysers, hot springs, and fumaroles occur in isolated groups, or along a line of fissure which often runs along the floor of a valley or lower flanks of a range of hills. The geysers deposit silicious and calcareous sinters, mostly the former; and the fumaroles yield native sulphur. Everywhere the air is pervaded with the smell of sulphur dioxide. The solfataric action is energetic, waning, or dead. With the latter the vents are closed by crustification. Where the hot springs overflow on the surface, they form thick mushroom-shaped mounds of silica. The silica is sometimes soft and porous, but often hard and chalcedonic. In all cases the hot springs and geysers are grouped around the volcanic vents, and along fissures in lavas near the point of emission. The waters range from strongly alkaline to acid; and at Rotorua alkaline and acid springs exist side by side. The ascending deep-seated waters are strongly alkaline, while the source of the acid waters is the superficial deposit of pumice which overlies the rhyolite. The pumice contains disseminated marcasite, and where the alkaline waters come in contact with the pyrite they are oxidized and reach the surface either neutral or acid, according to the degree of oxidation.

In the Hauraki gold-mining area, which adjoins the northern end of this volcanic region, the country rock consists of andesitic lava, tuff, and breccia of younger Tertiary age, resting on slaty shale and graywacke of probably Triassic age. The gold-bearing veins traverse both the andesite and tuff, but are only productive in the former. They are fissure-veins; but they do not conform to the usually accepted definition of a true fissure-vein, since they are generally confined to the igneous-rock formation. Near the borders of the andesites the veins are small and unimportant, and generally die out when they reach the underlying basement rock. On the other hand, the larger and more productive veins are grouped around the old vents, and there seems to be no reason why they should not descend to a great depth. In opposition to this view Professor Beck[5] states that it is inconceivable that mineral deposits could be made from solutions at great depths. The country encasing the ore-veins is altered to a moderately hard gray rock.

In the Thames district the distance between the numerous parallel veins which traverse the goldfield seldom exceeds 200 yards, and in almost every instance the veins are separated from each other by a narrow belt of hard unaltered andesite. These hard 'bars' as the miners term them, possess the same general strike and dip as the veins, and in cross-section present the appearance of lenticular masses. They vary from a few feet to 30 yards in width. The country rock has been found to be altered or propylitized down to a depth of nearly 1,000 ft. below sea-level, which is the greatest depth reached by mining. The propylitization of the andesites is not widespread, but confined to small areas grouped around the old volcanic vents. Away from the eruptive centres the andesites have suffered surface-decomposition, but are not propylitized. The propylitization was apparently effected by the fissures, which are now veins, having served as channels for the circulation of the hot mineral waters. From these fissures the waters acted on the rock on each wall, and where the fissures were near each other the metasomatic processes operating from one fissure met those coming from the other. Where the processes of alteration did not meet, narrow irregular sheet-like masses of unaltered rock—the 'bars'—were left between.

At Waihi and surrounding districts the veins are chiefly composed of chalcedonic quartz, possessing all the characteristics of solfataric origin. Some of the larger lodes can be traced on the surface for a distance of 16,000 ft., but the length of the majority is under 5,000 ft. Besides veins having linear extension, there are many huge mushroom-shaped masses of chalcedonic quartz, closely resembling in form the silicious deposits now forming in the volcanic regions around Rotorua and Lake Taupo.

At Kuaotunu and Great Barrier island there are many mushroom-shaped deposits of chalcedonic quartz of great size, in some cases covering thousands of acres. At Kuaotunu they are more or less circular in shape, and seldom exceed 20 ft. in thickness. At Great Barrier island the largest deposit is of an unusual character.[6] It is nearly two miles long, half a mile wide, and from 50 to 700 ft. thick. The pipe is completely filled with mineral matter. It has been intersected in four mines in a distance of a mile, and opened up by levels for many hundreds of yards. It varies from 12 to 40 ft. in width, and is filled with dense banded chalcedonic quartz, in

*Abstract from paper by Professor James Park, Director of the School of Mines, Otago University, New Zealand. The original paper was read before the Otago Institute. 'Transactions of New Zealand Institute,' Vol. XXXVIII.

[1]Svante Arrhenius, 'Zur Physik des Vulkanismus,' Geol. Foren. Forh., Stockholm, 1900.

[2]C. Barus, 'Hot Water and Soft Glass in their Thermo-Dynamic Relations,' Am. Jour. Sci. iv, Vol. IX, p. 161.

[3]C. R. Van Hise, 'Some Principles Controlling the Deposition of Ores,' Trans. A. I. M. E. Vol. XXX, p. 27.

[4]Sir James Hector, 'On the Recent Volcanic Eruptions at Tarawera,' N. Z. Reports of Geol. Explorations. 1886-87,

[5]'Lehre von den Erzlagerstätten,' 1901, p. 139.

[6]J. Park, 'The Geology and Veins of Hauraki Goldfields,' Trans. N. Z. Inst. Min. Eng., Vol. I, p. 137.

which iron and silver sulphides are sparingly distributed. The evidence furnished by the mine-workings implies that the overlying mushroom or umbrella of quartz was deposited on the surface from thermal water issuing from a long fissure in the andesite.

The molybdenite deposits at Jeff's Camp, in the Hodgkinson Goldfield, in Queensland, are described by W. E. Cameron[7] as roughly circular or oval-shaped outcrops of quartz, or 'blows,' carrying wolfram and native bismuth. The 'blows,' when followed down develop into irregular pipe-shaped masses surrounded on all sides by granite, which is the country rock. When the quartz is extracted there remain only empty pipes or vents. These pipe-like orebodies possess a peculiar genetic interest. They appear to closely resemble the silicious pipes formed in rhyolite by the hot springs in the Rotorua volcanic region and the mushroom-shaped quartz 'blows' at Kuaotunu.

There are near Waihi, in New Zealand, several massive deposits of chalcedonic quartz which are stated by Rutley to be replacements of the andesitic country rock[8] A similar replacement of andesite by silica is described by Spurr as occurring at Monte Cristo district in Washington.[9] He mentions that the silicification has proceeded until most of the rock is made up of quartz, which, he says, varies from coarsely to finely crystalline in structure, and contains sulphides, chiefly blende, pyrite, and chalcopyrite. Spurr continues, "Thus we have a complete and gradual transition from andesite to a sulphide ore with quartz gangue, by the progressive replacement of the original materials by silica and metallic sulphides."

In 1894 and 1896 I made an exhaustive examination of the Hauraki andesites for gold and silver. The samples subjected to examination were selected by myself *in situ*. The analyses were conducted by the cyanide test, on samples ranging from two to five pounds. The pulverized material was leached in glass jars with a 0.3% aqueous solution of pure potassium cyanide for 72 hours. The solutions and washings were evaporated, fluxed with a little pure litharge and borax, and the resulting button of lead cupeled. Simultaneous tests were made so as to check the purity of the litharge and fluxes. All the andesites examined were found to contain gold at the rate of 1 to 1.5 gr. per ton, and silver varying from 3 to 30 gr. per ton of rock. The augite-andesite, at 3,000 ft. from the mouth of the Moanataiari tunnel, contained 1½ gr. gold and 3 gr. silver per ton; and the hypersthene-augite-andesite, from the waterfall in Waiotahi creek, near the Fame & Fortune mine, 1½ gr. gold and 30 gr. silver.[10]

A petrological examination[11] of the rocks showed that the feldspars and pyroxenes sometimes showed signs of alteration. The samples were selected from the least-altered rocks obtainable, and in no case did they contain visible pyrites.

The evidence is by no means conclusive that the gold and silver are primary constituents. Whatever the source of the gold may be, I am inclined to agree with Percy Morgan[12] that the quantity of gold and silver in the veins is too great to be accounted for by the traces existing in the andesite.

J. R. Don,[13] made an interesting examination for the presence of gold in the andesites and propylites of the Thames Goldfield. He states that his tests were made upon the concentrate obtained from large samples by the method of crucible fire-assay. His results, in the case of the unaltered andesites, were negative; from which he concluded that these rocks contained no gold. The question that will naturally suggest itself to the mind of the metallurgical chemist, accustomed to the estimation of infinitesimal quantities of gold in cyanide solutions and residues, will be, is the method of crucible or pot-assay capable of sufficient refinement to indicate the presence of gold in the proportion of a grain or two to the ton of rock?

My early tests of the Hauraki andesites in 1894 were made by the crucible-assay method. The results, however, were often discordant and unsatisfactory, chiefly on account of the many sources of possible error inherent to the method—errors that it was found impossible entirely to eliminate. Believing that trustworthy results could not be obtained by the pot-assay, I adopted a method of leaching the pulverized rock with dilute solutions of potassium cyanide. By this process larger samples could be tested than by fire assay, and the possible sources of error were reduced to a minimum. The crucible assay is clumsy, laborious, and, in my experience, incapable of the refinement required for the estimation of minute traces of gold even in the hands of the most skillful manipulator.

Luther Wagoner,[14] of San Francisco, who in 1902 made a number of tests for gold and silver in sea-sediments, sandstones, syenite, granite, basalt, diabase, etc., by the cyanide method used by me in 1894 and 1896, arrived independently at the same conclusion. Discussing the assay of rocks, he says,[15] "The statement of Dr. Don that country rocks can be assayed by panning down a quantity and assaying the residue has been tested, as well as the statement that pyrites must be present in order to find gold; and my experiments show that both statements are incorrect—or, at least, not in accord with my experience."

At Te Aroha, near the northern boundary of the central volcanic region, there are (in the andesites) hot springs; 25 miles distance, soda-water springs; and at the Thames, ten miles further north, gas springs which discharge enormous volumes of carbon-dioxide. In the mines at the north end of the Thames Goldfield, the CO_2 issues with great force from cracks and fissures in the rocks. The mine-shafts are situated near the foreshore, and descend to depths varying from 500 to 900 ft. below sea-level. In close muggy weather in summer, with a low barometer, the gas rises in the mines, and, flooding the workings, drives the miners before it. Sometimes the gas rises up to the top of the shafts and overflows at the surface. Notwithstanding the special precautions employed to effect ventilation and to warn the men of danger, several fatal accidents have taken place in the past thirty years.

In the Big Pump shaft, the CO_2 escapes with such force as to cause violent boiling all over the surface of the water in the well. The depth of the shaft is 640 ft., but the workings are flooded up to the 500 ft. level, in consequence of which the gas escapes against a head of 150 ft., equal to a hydraulic pressure of 65 lb. per square inch. The commotion at the surface of the water at the 500-ft. level is caused by the escape of the gas which is not dissolved by the water. The pump has been raising water from this shaft for over a quarter of a century at the rate of 750 gal. per min. The water is so highly charged with gas as often to cause trouble in working the pumps.

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[7] Walter E. Cameron, 'Wolfram and Molybdenite Mining in Queensland,' Geol. Survey Report No. 188, p. 7,

[8] J. Park and F. Rutley, 'Notes on Rhyolites of the Hauraki Goldfields,' Quart. Jour. Geol. Soc., London, 1899.

[9] J. E. Spurr, U. S. Geol. Survey, Twenty-second Annual Report, p. 833.

[10] J. Park, 'The Geology and Veins of Hauraki Goldfields,' Trans. N. Z. Inst. Min. Eng., 1897, p. 52.

[11] J. Park, 'Some Andesites from the Thames Goldfields,' Trans. N. Z. Inst., Min. Eng. Vol. XXXIV, p. 435.

[12] Percy Morgan, 'Notes on the Geology, Quartz Reefs, and Minerals of Waihi Goldfield,' Trans. Aust. I. M. E., Vol. VIII, p. 164.

[13] J. R. Don, 'The Genesis of Certain Auriferous Lodes,' Trans. A. I. M. E., Vol, XXVII, p. 564.

[14] Luther Wagoner, 'The Detection and Estimation of Small Quantities of Gold and Silver,' Trans. A. I. M. E., Vol. XXXI, p. 198.

[15] *Loc., cit.*, p. 808.

At Waihi, Kuaotunu, and Great Barrier island there are huge veins of quartz, mostly chalcedonic, many of which are still capped with wide mushroom-shaped quartz 'blows.'

Posepny[16] mentions the remarkable occurrence of tree-stems changed to galena in the Vesuvian mine, Freihung, in Bavaria. In these the fibre and annular rings can be easily recognized, being extremely plain on polished surfaces. In the tuff-beds associated with the gold-bearing andesites, masses of wood, partly or wholly silicified and spangled with nests and veins of iron pyrite, are of common occurrence throughout the Hauraki region.

The Martha Lode and its numerous ramifying branches, the Silverton, Union, and Amaranth lodes, at Waihi, are all contained in an area of about a square mile. The huge lodes, wide zones of silicified andesite, and extensive propylitization of the andesite, prove that Waihi was an area of intense hydro-thermal activity some time prior to the eruption of the later rhyolite flows which now form the plains and wrap around the isolated outcrops of andesite containing the Martha and Silverton veins. The propylitization has already been shown by the Waihi workings to extend to a depth of nearly 800 ft. below present water-level—that is, some 500 ft. below sea-level. Obviously, the alteration of the andesite was due to the action of ascending and laterally moving thermal waters.

At Thames and Coromandel some of the most productive veins do not reach the surface of the enclosing rock, and the mine-workings at Waihi have disclosed a similar feature in connection with a few valuable veins in the Waihi company's property.[17]

In 1888 Captain F. W. Hutton, as a result of a petrographical examination of the Thames mining district, concluded that the veins were of hydro-thermal action.[18]

T. A. Rickard, a well-known American geologist who examined the same goldfield in 1891, when discussing Professor Posepny's paper on 'The Genesis of Ore-deposits,' describes the characteristic features of the district with the view of adducing additional evidence of the association of thermal springs and later eruptive rocks.[19] He states that his examination of the ore-occurrences and vein-structure, though incomplete, led him to conclude that the deposition of the gold and its associated minerals had followed certain lines of altered country rock which had been exposed to the effects of dying but lingering solfataric agencies.

SKY-SCRAPERS.—An eminent New York engineer and practical builder who has to his credit many of the finest skyscrapers of the metropolis, states that a 100-story building, built of reinforced concrete, and towering more than 1,000 ft. from the ground, may yet be seen by people who are living and even reached middle age. The 50-story buildings which are being seriously considered as a future possibility, will constitute but a stepping stone to the 75-story buildings and then to the 100-story buildings. The principal drawback which now presents itself is said to be the impossibility of providing elevator accommodations for even a 50-story building, for the reason that the weight of the cable to support a car in the numerous 30-story buildings now in commission, is enormous, and some other method of utilizing the upper floors will have to be invented and introduced before the skyscraper can be built any higher. The limits of the elevator, as understood at this time, have already been reached.

[16]Franz Posepny, 'The Genesis of Ore-deposits,' A. I. M. E. 1901, p. 129.

[17]P. C. Morgan, 'Notes on the Geology, Quartz Reefs, and Minerals of the Waihi Goldfield,' Trans. Aust. I. M. E., Vol. VIII, p. 168.

[18]F. W. Hutton, 'On the Rocks of the Hauraki Goldfields,' Trans. Aust. A. Adv. Sci., Vol. I, p. 245,

[19]T. A. Rickard, 'The Genesis of Ore-deposits,' A. I. M. E., p. 222.

Mine and Mill Reports.

Written for the MINING AND SCIENTIFIC PRESS
By J. T. THOMPSON.

The form of many mine reports evidently assumes the work of an extensive office force and suggests that they were prepared by or for the expert accountant; the result is that they are too complicated, not elastic enough to be used or applied in a practical manner by practical men, especially in the early stages of development, when systematic accounts are seldom attempted, and in consequence many valuable data are lost.

To be effective, a form of report easily understood by the average foreman is a necessity; it should be of such construction as to be readily compared, and also capable of expansion as the work progresses, without the necessity of change. The final summing up must be done in the office, to an extent depending on the manager or book-keeper, the former with simple blank forms and a very simple outfit of books can have his mine accounts in excellent shape with a minimum expenditure of labor and time; from these records the accountant can elaborate to his heart's content.

SURFACE AND HOIST REPORT.

To.....Manager.

Sir: The following is a statement for the period from 6 A. M....., 190..., to 6 P. M....., ..., 190...

	Where.	Sun.....	Mon	Tues....	Wed	Thurs...	Fri.....	Sat.....	Total ...	
Number of men employed										
Foremen .....@ $										
Engineers, } Machinists } .....@										
Firemen.....@										
Blacksmiths .....@										
Carpenters.. .....@										
Laborers.....@										
Helpers.....@										
Extra labor:										
Fuel, waste:										
Oils, cylinder and light:										
Material, shaft:										
Material, cars, tracks:										

Repairs, pumps, engine, etc.

Construction, new work:

Supplies received:

Requisition for supplies:

Remarks, suggestions:

Approved.....190...

.....

.....Manager.

{Day / Night} Foreman.

(This report to include repairs and replacements on rope, shaft, cage, engine, pumping, ventilating and compressing.)

The models of reports herewith submitted have stood the usage of over 12 years in nearly every form of metal mining, from Peru to Alaska, and it is surprising how well they fit every demand. It is not claimed that they are perfect and any suggestion of improvement will be gladly welcomed, but theoretical additions, it must be borne in mind, are not always improvements. Simplicity is what is desired, otherwise the value of such reports is questionable; and the same applies to them if they are filled out in perfunctory, mechanical way, or by guess. Aside from many other advantages, their value in systematizing the foreman's work is much more than the cost.

With the exception of the battery ticket, the reports are printed on paper 8½ in. wide and 14 in. long. The battery ticket is 5½ in. wide by 7 in. long. Certain omissions are intentional and in some cases it will be necessary to fill in the report at the office to make it complete. To prevent waste of the blanks, and prevent duplication as far as possible, it may be advisable to number them consecutively, requiring defaced blanks to be returned.

MINE REPORT.

This report to include all work in mine, other than track, cars, shaft repairs, pumps.

To.....Manager.

Sir: The following is a statement for the period from 6 A. M....., ..., 190..., to 6 P. M....., ..., 190...

	Where	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total
Number of men employed									
Foremen.....@ $									
Miners sinking.....@									
Miners driving.....@									
Miners cross-cutting @									
Miners stoping .....@									
Miners timbering .....@									
Carmen .....@									
Muckers .....@									
Laborers .....@									
Powder, weight and kind..									
Fuse, ft.....									
Caps, number.....									
Candles, number									
Timber, size and length.....									
Lumber, size and length...									
Drills, size and length { New, re-sharpened }									

Extra labor (expense)

Extra Material (repair and construction)

Supplies received:

Requisition for supplies:

Remarks, suggestions:

Approved.....190...

.....
{Day / Night} Foreman.

.....
Manager.

MILL REPORT.

To.....Manager.

Sir: The following is a statement for the period from 6 A. M....., ..., 190..., to 6 P. M....., ..., 190...

		Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total
Number of men employed									
Assayer.....@ $									
Millman.....@									
Amalgamator .....@									
Cyaniders .....@									
Engineers .....@									
Firemen .....@									
Carmen.....@									
Laborers .....@									
Milling ore delivered	cars / tons								
Shipping ore delivered	cars / tons								
Ore milled	from / tons								
Ore sacked	sacks / weight								
Concentrate saved	sacks / weight								
Gold produced	free / amalgam								
Average assay-value	ore / concentrate / tailing								
On hand, weight	milling / shipping / concentrate								
Average number stamps at work									
Average number drops per minute									
Mercury expended	amalgamators / mortars / plates								
Amalgam retorted									
Mercury recovered	mill / retort								
Sponge gold									
Melted gold									
Mercury loss	mill / retort								
Picked ore received	sacks / weight								

Approved.....190...

.....
{Day / Night} Millman.

.....
Manager.

CONSTRUCTION, GENERAL AND ORE REPORT.

To.....Manager.

Sir: The following is a statement for the period from 6 A.M....., ...190..., to 6 P.M....., ...190..., of construction, general labor, and estimated waste and water hoisted, and ore delivered to the mill.

CONSTRUCTION

Labor on

Material on

GENERAL.

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total
No. of men on payroll, mine								
No. " " surface								
No. " " mill								
No. " " misc.								

ORE, WASTE AND WATER

Ore hoisted	cars / amount								
Waste hoisted	cars / amount								
Waste to dump	cars / amount								
Rock to table	cars / amount								
Waste from table	cars / amount								
Ore to mill	cars / amount								
Shipping ore to mill	cars / amount								
Water hoisted	buckets / gallons								

Remarks:

Approved.....190...

.....
{Day / Night} Foreman.

.....
Manager.

DAILY BATTERY TICKET.

To.....Manager.

{Day / Night} Ending 6:.....M. .....190...

Lost time..... Stamps.....H. .....M.

Average number of stamps at work .....

Average number of drops per min. .....

Milling ore into bins ..... Cars.....Wt. .....

Shipping ore delivered ..... Cars.....Wt. .....

Assays: Concentrate .....oz. Tailing.....oz.

Amalgamator, amalgam..... balls..... lb.

Inside plate " ..... balls..... lb.

Table plate " ..... balls..... lb.

Total ..... balls..... lb.

Free gold.....5 stamps..... oz., 2 stamps .....oz.

Total crude amalgam on hand..... balls..... lb.

Concentrate collected ..... lb.

Concentrate sacked..... No. .....Wt.

ORE AND CONCENTRATE SHIPPED TO .....

Number	Date.	Number of sacks.	Weight lb.	Av. Wt. per sack.	Marks	Hauled by.	Remarks.
							Ore:
							Concentrate:

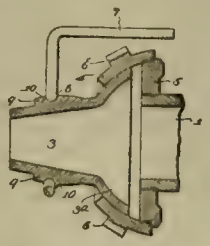
APPROVED .....190... .....
MILLMAN.

.....
TEAMSTER.

MINING AND METALLURGICAL PATENTS.

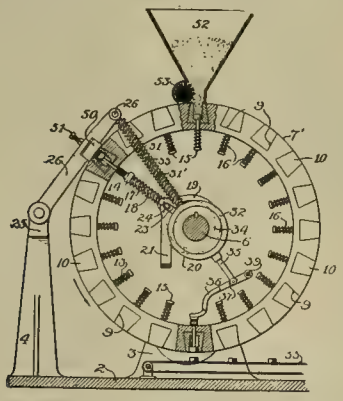
Specially Reported for the MINING AND SCIENTIFIC PRESS.

HYDRAULIC MINING APPARATUS.— No. 832,066; John Larsen, Burntranch, California.



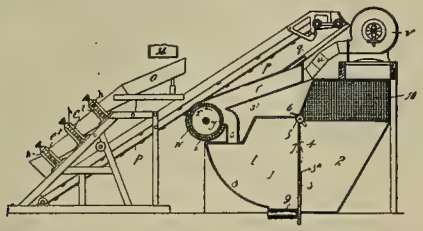
The combination with the nozzle of a hydraulic mining apparatus, of a tubular deflector having a swinging connection with the nozzle and provided with external projections, and a controlling handle having a loop embracing the deflector back of the projections, the loop being provided with internal seats capable of alinement with the projections to permit application and removal of the loop.

BRIQUETING MACHINE.—No. 832,553; Howard E. Marsh, Los Angeles, California.



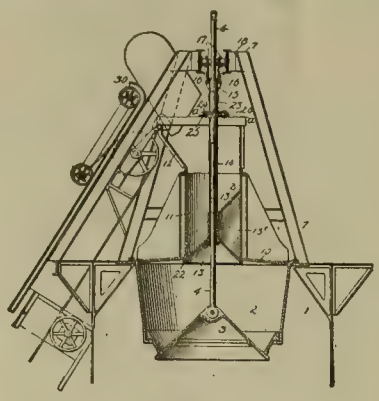
The combination with a main shaft, of a revoluble drum thereon having peripheral molds opening at the periphery of said drum, plungers in said molds, a compressor-arm pivoted externally of said drum in proximity thereto, means eccentrically connected with said shaft for operating said compressor-arm, an eccentric on said shaft, a strap operatively connected therewith, said strap provided with a hollow rod, a compressor-plate telescopingly connected with said hollow rod, a spring interposed thereabout, and ejector means.

MANUFACTURE OF FLAKE MICA FROM MICA PLATES, CRYSTALS, OR NODULES.—No. 832,494; Henry C. Mitchell, London, England.



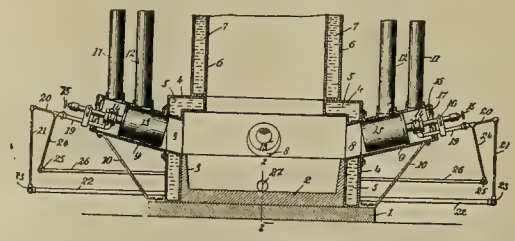
Apparatus for the manufacture of flake mica from mica plates, comprising one or more pairs of bending-rolls, means for conducting the mica plates between said rolls, a flaking-chamber provided with an inlet-chute inclined to the length of said chamber, means for conveying loosened and partly-opened mica plates from said rolls and introducing them into said inclined chute and flaking-chamber, means for forcing a blast of air into said flaking chamber, and a splitting and separating chamber in communication with said flaking-chamber.

FURNACE-CHARGING MECHANISM.—No. 832,536; David Baker, Wayne, Pennsylvania.



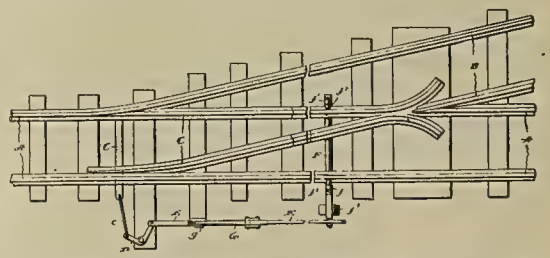
In a furnace-charging mechanism the combination with a receiving-chamber communicating with the interior of the furnace, of a distributing-bell adapted to close the lower end of said chamber and constructed to accumulate the stock delivered to the chamber to one side of the same when the bell is in closed position, means for opening the distributing-bell to discharge the contents of the chamber, and means for shifting the position of the bell to vary the point of discharge.

PROCESS OF SMELTING COPPER MATTE.—No. 832,738; William Kemp, Tucson, Arizona.



The method herein described of producing metallic copper directly from copper matte, which consists in subjecting the matte, while in hard condition, and in the presence of a flux, to the melting action of the flame of a burning mixture of oil-vapor, steam, and air.

AUTOMATICALLY-OPERATED SWITCH.—No. 832,659; Charles F. Eldridge, Herrin, Illinois.



In a device of the character described, a main line, a siding, a switch, means for automatically operating said switch, including a single tripping device positioned beyond the heel of said switch and adapted to be engaged by a wheel of a car after passing over said switch to throw the same to connect the main line and siding, and means for locking said switch in its open and closed position.

The Brothers Balanced Cableway.

What is claimed to be an important improvement in the construction of cableways is that known, from its patentee, as the Brothers Balanced Cableway, or Cable Crane.

The distinguishing feature of this engineering device is the employment of a counterweighted cable connecting shear legs free to oscillate in a vertical arc and the use of a self-propelled trolley or carrier, thus dispensing with all overhead ropes except the cable itself, which can be both shorter and lighter for a given working span and load, than that employed in the older form of cableway.

This arrangement is shown diagrammatically in Fig. 1, which illustrates the Brothers cableway successfully used in the building of the recently completed bridge across the Zambesi river in central Africa.

The Zambesi installation was used not only for transporting bridge material from the bank to its desired place in the structure, but for carrying entirely across the river all the material used in the construction of some 100 miles of track beyond the river, before the use of the bridge itself was possible. It is stated that on some days as much as 1,000 tons of material was thus transported. The working capacity of the cableway was 10 tons. The span was 870 ft., and the counterweight of the cable 144,400 lb. The counterweight

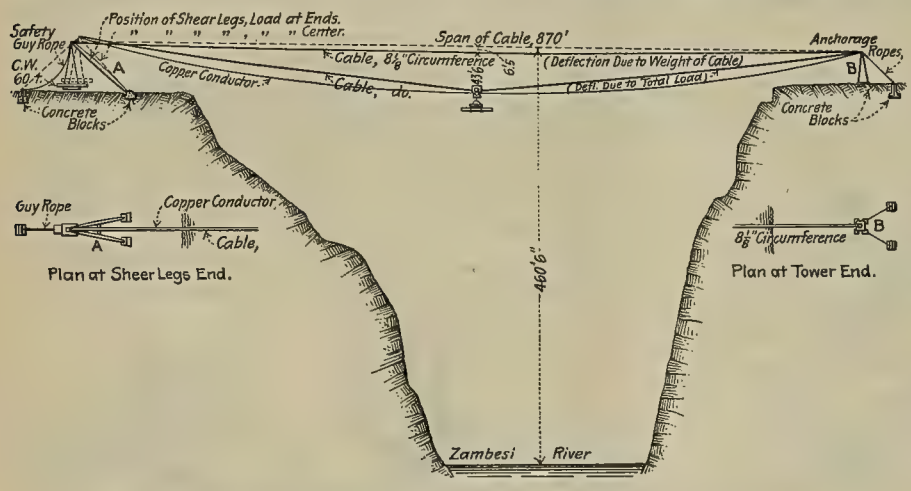


Fig. 1. The Brothers Balanced Cableway Across the Gorge of the Zambesi River.

had a vertical movement of 51 in. as the load crossed from one side of the river to the other, which movement of weight computed as horse-power, was equivalent to 17 h.p. per min., delivered at the load. That this movement of the counterweight was most effective when it was most needed, that is, just as the load was approaching the tower, was shown by noting its movement as compared to the travel of the load on the cable. With the load in the middle of the span, 435 ft. from the tower, the deflection of the cable was 43 ft. 6 in., raising the counterweight 4 ft. 3 in. The counterweight and shear leg would be lowered about 12 in. during the first 200 ft. of travel of the load, 12 in. during the next 135 ft., 12 in. during the next 50 ft., and 15 in. for the last 50 ft. of the load's movement. It is stated by the builders of the cableway that the saving in money due to this feature of balancing, and saving in maintenance of auxiliary machinery which would otherwise have been required, at the cost of power and repair work which prevailed at the Zambesi plant, was upward of $4,000 per year.

Owing to the design of the struts supporting the cable in the Brothers system, it is possible to place the feet of these close to the edge of the ground to be worked over, and from the fact that the cable is nearly horizontal as the load approaches the towers, to make them of less height than is necessary with other cableways, so that a shorter length of cable is required, and this of lighter section for the same working capacity, thus reducing first cost, freights, and cost of erection where it is to be used. It is entirely feasible to have these cableways deliver material 'behind' the towers, this having been done in most of the installations so far.

The hoisting of the load and the travel of the carrier on the cable is by an electric motor geared to the hoisting drum and to the carrier wheels, this motor being supplied with current from a generator placed at any convenient point, and transmitted from one of the towers to the carrier by a flexible copper cable. It is claimed for this system of cableway construction that a minimum of labor expense is incurred in operation, as the operator on the carrier is so situated that he can direct the work without the assistance of signalmen. On account of the lightness of the towers and the small amount of overhead rope these plants can be moved fram place to place with the greatest facility.

Until recently these cableways have been installed by W. F. Brothers, the patentee. The business has now been taken over by a company for which Mr. Brothers is consulting engineer, namely, The Balanced Cable Crane Co., of 135 William St., New York City.

Notice.

The Fred. M. Prescott Steam Pump Company is the owner of several patents upon triple expansion and multiple expansion engines, invented by Fred. M. Prescott, Milwaukee, Wis. These comprise United States patents 751,997, dated Feb. 9, 1904; 751,996, dated Feb. 9, 1904; 751,995, dated Feb. 9, 1904; 719,367, dated Jan. 27, 1903; 719,136, dated Jan. 27, 1903.

This company also owns several applications pending in the patent office, upon which patents are shortly expected to issue, covering other features in triple expansion and multiple expansion engines. These patents are considered to cover all available forms of construction including arrangements of piston rods and steam cylinders, which provide the one great desideratum in pumps and engines of this class, that is, accessibility of its parts and the ability to examine or remove any of the pistons or rods without tearing down or disturbing the steam cylinders or any of the heavier parts of the engine. Without these distinctive features the so-called triple expansion pump loses entirely its commercial utility.

There is no use, therefore, in our dilating further upon the advantages of our patented constructions, as they are fully appreciated by every engineer and user of this class of machinery. They are the product of much study and many years of experience in the development of pumping engines of these types and adapting them to various local conditions, on the part of Mr. Prescott, and are features of the utmost value to this company. It is, therefore, necessary for us to protect our rights and the exclusive ownership and control of these patents to the utmost.

We are sorry to note that certain infringements have been offered to the trade, and in all courtesy we desire to notify any would-be purchasers of the existence of our rights and that we shall be compelled to uphold and defend them wherever infringed.

FRED. M. PRESCOTT STEAM PUMP COMPANY.
Milwaukee, Nov. 6, 1906.

The Cia. Metalurgica de Michoacan, at Ocampo, Mexico, is installing a complete electrical plant, comprising apparatus from the works of the WESTINGHOUSE ELECTRIC & MFG. Co. What is called a three-wire arrangement is applied, which by an ingenious invention owned by the Westinghouse company, renders it possible to obtain 250 volts and 125 volts from the generator.

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Editorial.

THE UNITED STATES Geological Survey is publishing much invaluable material. We have just received J. E. Spurr's report on the Silver Peak district of Nevada, and N. H. Darton's work on the Bighorn Mountains of Wyoming. Both 'professional papers,' as these handsome treatises are termed, are splendidly representative of the science of the geologist and the art of the printer. No other geological survey in the world turns out such material as this in such a manner.

THE ARTICLE by Mr. Waldemar Lindgren will be appreciated by thoughtful readers. His terse summary of recent mining history is interesting and his comment on current conditions will win attention, for no one is better qualified to discuss these subjects. When will the era of new discoveries cease and when shall we have to fall back on the re-treatment of dumps and the beneficiation of low-grade ores only profitable when submitted to newer methods? We trust that uninteresting era will be after our time and we believe that there is still enough untried country to furnish discoveries for many a year. On another matter, that of the unintelligent marketing of ores, Mr. Lindgren gives good advice. 'People who sell their product without knowing just what it carries are likely to be misled, for it is not the business of smelting companies or sampling works to furnish gratuitous analyses. Gentlemen, utilize the services of the assayer and the chemist, to the end that you may work less in the dark and more in the ample light of ascertained fact.

THERE IS much talk in the daily press of the shipment of a million-dollar carload of ore from the Mohawk mine at Goldfield, Nevada. The fact is that the Hayes-Monette lease has yielded a carload that has been sampled already, the 35 tons having a gross value of $490,000. This is not a million, but it is a remarkable shipment; and being a fact, it is more interesting than the current stories. The time was when a carload meant 20 tons on a broad-gauge railroad and 10 tons on a narrow gauge, but nowadays the capacity of rolling stock has been increased to a maximum of forty or fifty tons of ore. With such stuff as Goldfield produces, a 50-ton car would have to average $20,000, or, say 1,000 ounces of gold per ton, to make a million dollars. Such a shipment is by no means improbable, if lessees or mine owners are willing to accumulate their best product in order to play to the gallery. Meanwhile, these are great days at Goldfield. An option on the Combination mine for the sum of $4,000,000 has been given to Messrs. Nixon and Wingfield, who represent the Goldfield Consolidated, a company recently formed by the merging of the territory covered by the Mohawk, Jumbo, Red Top, and Laguna mines. The Combination ground covers 205 acres and has produced nearly $2,000,000. If the option is ex-

ercised, the Goldfield Consolidated will become one of the great gold mines of America.

THE FARMERS in the Salt Lake valley have nearly killed the goose that gave them golden eggs. By their blackmailing suits against the smelters, they threaten to close the Murray plant of the American Smelting & Refining Company, and the smelting works of the United States Smelting, Refining & Mining Company, as well as those of the Utah Copper and Bingham Consolidated mining companies. The latest ruling is that the ore to be smelted must not contain more than 10 per cent sulphur, but it is not clear whether 4% stuff may be averaged with 16% sulphur ore. If such a mixture is not permissible, may material containing varying percentages of sulphur be mixed before delivery? It might be done at the mine or at the sampling-works. The incident illustrates the difficulty arising from unscientific applications of technical distinctions. At the present time the big lead smelter at Murray receives the galena concentrate from Park City; this material carries 12 to 15 per cent sulphur, and if the treatment of it is prohibited, the Murray plant must close down. The ranchmen of the Salt Lake valley apparently are destined to give an accentuated meaning to the term 'farmer' when used as a synonym for slow intelligence.

ON ANOTHER PAGE we publish abstracts from two reports of important mining companies. We advise the younger men—and others who are willing to learn—to read such reports, because they give valuable hints regarding the difficulties to be encountered in mining. The story of a prospectus and that of actual operations present a suggestive contrast; it is the difference between a forecast and a fact. Engineers will do well to get alongside the latter. Both at the Dolores and the Oriental mines there has been, and there is now, engineering talent of a high order, therefore the straightforward record of experience ought to be of service. At the Mexican mine the questions of transport, labor, and supplies have proved difficult, as they always are at new mines in out-of-the-way localities. Young engineers—and some old ones—are apt to minimize the importance of these factors in their relation to the earning of dividends, therefore Mr. John B. Farish's account ought to be helpful. Wide apart as the two mines are, it is interesting to note that tube-mill experiments are being made at both of them, and in Korea the testing of dredging ground is being carried out with a care that bespeaks sane management. In mining, as in other industrial enterprises, it is better to be sure than sorry.

WE PUBLISH some interesting comment by Mr. Philip Argall in regard to the report of the South African committee on the Standardization of Screens. The report will be useful, although in this case, as in other investigations of the same character, it would be more scholarly to acknowledge the efforts of those who have worked toward the same end. We have criticized the misuse of the term 'mesh' in these columns and in another place during the last four years, so that the findings of the committee are most welcome. It is to be hoped that technical writers, including the editors of the transactions to which they contribute, in South Africa, will take note of this matter. When men write, for example, of 200 mesh and mean 200 holes per square inch, confusion is sure to arise. 'Mesh' indicates the number of holes per linear inch without reference to the size of the aperture or, in other words, the width of the wires or metal separating each hole; therefore it is a step forward in precision of speech when 'mesh' is tabooed and 'aperture' is adopted. We hope that such phrases as "¼ inch mesh," meaning ¼ inch holes, will now disappear. Accuracy of statement always aids clearness of thinking.

A Regrettable Incident.

We have received a reprint of the correspondence between Mr. John C. Branner, professor of geology in Stanford University, and the Director of the U. S. Geological Survey, which appeared in *Science* of October 26. On the face of it, a grave injustice appears to have been done to a distinguished scientific man and a veteran geologist. Professor Branner was formerly State Geologist of Arkansas, and made the first authoritative surveys of the coalfields in that State. Owing to lack of funds, the final report was never published. There is a demand now for the completion of the work, with additional surveys to bring it up to date. The Director of the Survey wrote recently asking Professor Branner to co-operate. This he was willing to do, provided he was given charge of the investigation. In reply, the Professor was told that there were a lot of men on the Survey who were available for the duty and that the original work done by him would be of no practical value to them. Thereupon Professor Branner resigned from the Survey and wrote saying that the action of the Director was "an outrage and an unwarranted personal affront to which no self-respecting geologist can tamely submit." In this we agree with him; it was in the nature of the maximum injury it was possible to inflict upon a high-minded scientific man. Then followed a final exchange of letters, the Director stating that the original Arkansas survey was marred by many serious errors, making a re-survey necessary, while the Professor retorted by asserting that the maps of the U. S. Geological Survey in Arkansas were so poor as to be practically worthless and that if the topography needed revision it could be revised as well for him as for some one else. In concluding, Professor Branner makes a vigorous attack on the tendencies of the officials at the head of the U. S. Geological Survey, claiming that this national bureau has grown into a scientific trust and that geologists are not treated with common courtesy unless they have political backing.

The episode is most regrettable. It will be taken as evidence of the desire of the Survey at Washington to encroach upon the rights of individual geologists and of the State Surveys. Certainly, it looks as if the latter were to be slowly snuffed out. The political pull behind the bureau at Washington is too strong. In the Irrigation Congress, in the Mining Congress, and in other organizations of the kind, the officers of the Survey have taken prominent part, thereby strengthening their position before those who vote for appropriations in Congress. It

is a pity that our legislators do not see the great service done to the country by the scientific investigation of its resources, without requiring the investigators to spend so much time in the lobby, and it is a greater pity that to emphasize the necessity for its existence, the Survey must invade the domain of others, just as well qualified to do geological work. This last incident is quite in line with the contention that we have made on previous occasions, that the Geological Survey is becoming an unwieldy bureau, in which the scientific spirit is being killed by too much politics and by the spreading out of its activities so that they include forestry, irrigation, reclamation, and other such matters as do not belong to a geological department.

Health Underground.

In our last issue we gave a summary of the investigation recently made into the unhealthy conditions among which the miners work in the deep mines of Bendigo. It is asserted that Bendigo miners die at the average age of 41 years. Certainly, it was time to do something. The Mine Managers' Association in that celebrated district has taken the matter to heart and there is good reason to expect that greater care will be taken to connect the deep workings, so as to stimulate natural ventilation, and also to encourage the more general use of atomizers and water sprays in raises and in the dead ends of drifts or cross-cuts. In South Africa, also, the waste of life in mines is attracting attention. It is claimed that the accident rate is abnormally high, and that it is due to preventable causes. The inspectors fail in their duty. In 1905 the average fatality rate was 7.35 per thousand, the rate being highest among the white miners. Last year it was 9.6 per thousand, as compared to 2.49 in the English metal mines. The Government Mining Engineer has complained of his inability to enforce the regulations. This is a blot on the economics of mining on the Rand, for, apart from even the commonest feeling of humanity, it is obvious that physical danger and good workmanship cannot go together. Mine managers everywhere are lacking in sense if they do not appreciate that the cost of mining is in direct ratio to the efficiency of the apparatus they employ, and of all the machinery in a mine none is affected by unfavorable conditions so greatly as is the muscular machine known as a man. This is generally appreciated nowadays; there was a time when workmen were treated like cattle, and the employment of convict labor in Europe or of colored races in other parts of the world had a bad effect in rendering superintendents careless of the physical protection of those who pursue an occupation that can be made—though it is not necessarily—hazardous by disregard of ordinary precautions. On the Rand they need labor so much that it seems reckless to squander it—in accidents. At Bendigo they endure unhealthy conditions simply because they have become used to them, until someone from the outside exposes the barbarity of it. Two such famous mining centres ought to be an example, instead of a warning, in the safe-guarding of health and life underground.

By the Way.

On the occasion of the opening of the new Engineering Building of the University of Pennsylvania, Mr. Charles W. Baker, editor of *Engineering News*, said:

It may be a new idea to many of you that the Technical Press is a school. It never has been counted in by the statisticians of the Bureau of Education. No State nor city pays taxes for its support. Not one tainted cent of anybody's money has ever been invested for its endowment. Yet I will vigorously defend the thesis that the Technical Press is a school; and a school whose influence for progress can hardly be overestimated.

The building today dedicated will shelter about 600 students; but in the world-wide class-rooms of my own institution you may find thrice as many thousands. The students of the technical school are boys, perhaps 18 to 23 years old; but the students of the Technical Press include not only these youths, but their instructors as well, and not only the instructors, but the men in active professional work, ranging all the way from the green graduate, trying to hold down his first job, to the Nestors of the profession, full of years and honors, and let us hope of dollars also.

Pardon me if I make one more comparison. The boys who receive their training in the fine building dedicated today are not, at their graduation, engineers. They have only laid a good, strong, permanent foundation. The force headed by Professor Marburg and Professor Spangler have sunk the caissons deep in those hollow skulls and filled them with concrete—facts. It is a fine foundation, clear up to the capstone on top of the pier—but the superstructure is still to be built. The boy goes out after graduation and goes to work to become an engineer, and his instructor and mentor and aid in this post-graduate course is the technical journal.

I want to emphasize the fact that it is the superstructure and not the foundation which it is the business of the Technical Press to build. Any intelligently conducted technical journal excludes from its columns elementary matter, contained in standard text-books, and also everything which is already matter of common knowledge in the profession. It seeks for the benefit of its readers the sort of information which is not yet found in the text-books nor taught in the class-rooms. Wherever a man is doing work in a new and a better way with new and better tools or machines—wherever progress is being achieved—it is the province of the Technical Press to make that progress public for the general benefit.

And now let me point out to you one radical difference between the technical school and the Technical Press School. The professors in the technical school are there to instruct their pupils; but the editors of the Technical Press are never wise enough to instruct all of their readers all of the time. The wisest attempt it least. The real teachers in the Technical Press School are not the editors, but the contributors. The technical journal is a co-operative exchange. Its business is to tell the story, week by week or month by month, of current progress. Its pages are wide open to the man with a record of progress—real progress and not mere blowing of horns—if that record will be of practical service to the readers. The editor's function is like that of a baseball umpire—to say what is a hit and what is a foul and to endure with patience the objurgations of those who object to his decisions.

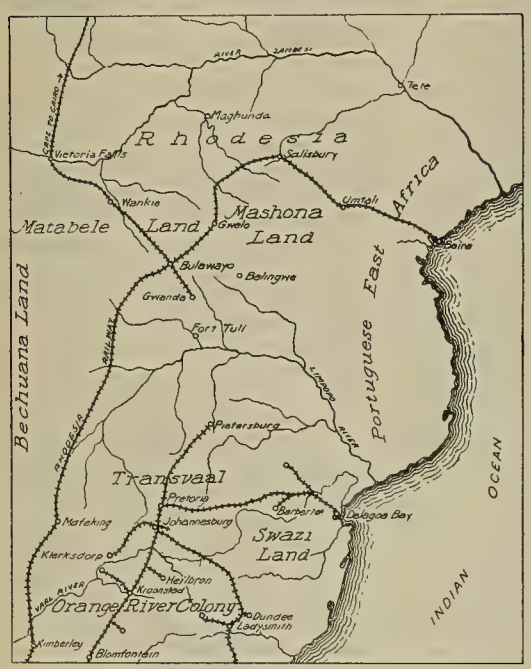
AN interesting contrast between the geology of the present day and that of half a century ago, is presented by the complete emancipation of the modern geologist from the controlling and perverting influence of theology, all-powerful at the earlier date.

Special Correspondence.

Johannesburg, Transvaal.

A Bad Accident.—Gold Reserves.—Publication of This Account.—Scarcity of Labor and Cash.—Several Mines Shut Down.—J. H. Curle is Justified.—Decreased Immigration.—Fewer Chinese Outrages.

We were horrified two days ago by a skip accident on the Simmer East mine. While the man-cage containing 23 Chinamen was descending the shaft, the rope broke about 700 ft. from the surface, and the unfortunate victims fell a vertical distance of 1,200 ft. They were crushed to a pulp, and were buried in one grave, as it was impossible to identify them. An investigation no doubt will be made by the Government. The first report is to the effect that the accident is not due to a defective rope, but that a bolt in the drum on the engine worked loose, caught the rope, and caused it to snap. This is the



Map of the African Goldfields.

second serious rope accident on the Rand since the war, the other one having occurred on the Robinson Deep, when 40 or 50 Kaffirs were dashed to pieces.

During the past week two important yearly meetings were held, those of the Nourse Mines Ltd. and the Langlaagte Deep. Reference was made to the practice of keeping gold reserves on the Rand. Every mine that can do so, builds up a reserve, varying from a few hundred to several thousand ounces. Even on the Rand, where the ore is fairly constant in value, compared with other places, it is found difficult to keep up a uniform output without a reserve. It is fair to state that this reserve has never yet been used for market rigging purposes, as in other places. By careful calculation the grade of a mine is determined, and if in any month the output is too high, a few hundred ounces are put to one side. In the past the shareholders have not been told what amount of gold was held in reserve. This policy is to be changed in the future, as was intimated at the two meetings held last week. Along with the monthly output will be published a statement of the reserve gold account, so that shareholders may know exactly how they stand. It is probable that all the mines of the Rand will follow this example of publishing the reserve account.

Many developing mines are closing down, on account of the uncertainty of the labor outlook. In the Eastern Rand the Cloverfield mines have ceased work; also the Driefontein Deep, while several other developing mines are on the verge of ceasing work. Many of the developing mines will be forced to close down on account of a shortness of cash. The market is so bad at the present time that it is nearly impossible to dispose of reserve shares at anything like a decent figure. By glancing down the list of shares quoted, one soon realizes that deep-level propositions are distinctly out of favor with the investing public. Shares that stood at 70 to 80s. a year or so ago can now be bought for 19 to 20s. None of the deep-deeps stand much above par. During the 'deep level' mania, people were paying fancy prices for these shares. The very disappointing results obtained on some of the new deep levels account for the depreciation of these shares. For a long time people spoke of Mr. J. H. Curle as a rank pessimist, when he cast doubt on the value of mines deeper than 3,000 ft., but his words are coming true to a great extent. The only hope is for reduction in working costs.

As could be expected, there is a big slump in the building trade of Johannesburg. Most artisans who could afford it have left the Rand. The incoming boats are bringing very few passengers to South Africa. The news of the severe depression seems to have traveled far and near, so that workers are afraid to come to South Africa. For farmers there is little chance in this country without capital, so farm hands leave Africa severely alone, and migrate to America or Australia. Last January the number of buildings erected was 627, valued at £173,298, while in September there were 350 buildings built, valued at £76,676.

There has been no Chinese outrages during the past fortnight. Most of the desperate characters have been sent out of the country, so that there should be much less crime than formerly.

Joplin, Missouri.

Record Production—Year's Output Worth Fifteen Millions—Several Strikes of Ore—Successful Drilling.

For the first time in the history of mining in this district, the value of a single week's shipment exceeded $400,000, and it created less excitement locally than when a single week's value first passed the $100,000 mark. That event was in the latter part of the year 1889, when zinc ore reached the then unprecedented value of $32.50 per ton, and lead ore was $57 per ton. Last week zinc ore was selling for $49 per ton and lead ore at $85.50 per ton. Not only was the value greater last week, but the shipment of zinc ore was 320 tons more than the largest week heretofore, which was the second week in last May. The lead shipment was 248 tons less than the big week in May. The figures for last week were: Zinc ore, 14,975,890 lb., valued at $339,125; lead ore, 1,592,180 lb., valued at $63,574; combined value, $402,699. Compared with the same week last year this was an increase of 5,354,220 lb. zinc, and 335,170 lb. lead ore and an increase in value of $133,024. Compared with the previous week this year, it was an increase of 5,136,300 lb. zinc, and a decrease of 44,400 lb. lead ore and an increase in value of $122,059. The shipment for the 46 weeks of this year is 495,105,900 lb. zinc and 69,386,100 lb. lead ore, with a combined value of $13,387,784, which is an increase over the same period of last year of 46,105,460 lb. zinc and 13,462,200 lb. lead ore, and an increase in value of $1,631,459. If the remain-

ing six weeks of this year keep up, the average ore output will exceed $15,000,000. The first touch of winter came last Sunday night with a vengeance and has continued thus far into the week; so that this week's shipment is likely to be below the average.

The Ideal Mining Co., operating on the Rex Mining & Smelting Co.'s land east of Joplin, three weeks ago, sold about 700 tons of zinc ore to the Mineral Point Zinc Co. and last week finished loading it into a train of 21 cars. The ore was an accumulation formed since they started the mill on August 9, and has all been produced from the 50-ft. level.——A big strike of lead was made last week on the Smith & Stickney lease, at what is called Four Corners, north of Joplin. The lead was found in running a drift at the 30-ft. level and 6,000 lb. was hoisted in a few hours' work. This lease has been producing zinc and lead for some time, but the lead has never been found in the quantity that this new strike shows it.——The Whitsett Mining Co., operating on the Trinity Zinc Lead & Smelting Co.'s lease at Porto Rico, made its initial turn-in last week, amounting to 61,990 lb. zinc ore. The Trinity Co. has a large tract of land lying south of the Ground & Irwin lease at Porto Rico, and in a short while there will be lively competition between the two companies for first place in the Duenweg district. The Chapel mine is also on the Trinity lease, with two or three more soon to open up.——The Alliance Land & Mining Co., operating on the Louie Stevison land north of Duenweg, made its first turn-in last week, amounting to 17,730 lb. lead ore. They have a new modern mill and will soon be classed among the regular producers.——Chapman & Lennon, owners of a lease adjoining the Underwriters' Land Co., north of Webb City, now have their shaft down to the ore, which is said to be as rich as any in that section. Their new mill, which they have been building while development work was going on, is rapidly nearing completion, and by the time the ground is thoroughly opened up, it will be ready to handle the dirt.——The Granby Mining & Smelting Co. discovered a good body of ore in the second hole they are now drilling on their land near Chitwood. This hole was put down about 180 ft. west of the first one, in which a limestone bar was encountered and no ore found. Their drilling is for the purpose of locating the lime bars, as well as the bodies of ore.

Calumet, Michigan.

Hancock Consolidated.—The Arcadian and Its Prospects.—Testing the Nonesuch.—Experiments in the Baltic and Champion Mills.—The Michigan Mill.—Activity in Keweenaw County.—Satisfactory Development in the Superior.—Mass Copper in the Michigan.

Mining operations in the Hancock Consolidated mine were started this week. The old shaft on the original Hancock mine was unwatered a few days ago; the workings are being cleaned out and other preparations made for pushing development along broad lines. It will be impossible to operate on a large scale until the shaft and workings are in fit condition. The skip-road in the shaft is being repaired and new rails laid in places. The timbering was made secure as unwatering advanced. It is uncertain when the repairs will be completed, but it is expected that everything will be in shape by the end of next week.

In barring down the loose ground in the shaft and drifts in order to render the workings safe, some copper ore has been exposed. All the ground has been stoped out in the old Hancock as far as the drifts extend, but it is expected that drift stopes will be started at the most favorable points so as to permit of immediate production. It is the policy of the management to place the mine on an earning basis just as soon as possible. It is expected that next month the big vertical shaft that is to open the Quincy, Hancock, and other lodes in depth, will be started.

As the Hancock will be producing in a short time, it is interesting to note what its production was under the former management. The mine was first opened in 1861 and worked intermittently until 1885, when copper slumped to 10 cents per pound, forcing the suspension of operations. Between 1861 and 1885 the mine produced more than 5,750,000 lb. refined copper, and during the last eighteen months that it was active the ore averaged 20 lb. copper per ton. With the modern methods now in vogue, it is expected that a greater copper recovery will be effected so that the rock should yield at least two or three pounds of copper more to the ton. The old Hancock mine comprised only 140 acres, in which is sunk the shaft where operations were resumed recently, but the Hancock Consolidated Mining Co., the present concern, owns 860 acres. The best portion of the Quincy mine adjoins the Hancock boundary. In connection with the sale of a portion of the Arcadian lands to the Quincy company, it may be said that the organizers of the Hancock Consolidated, which secured much more valuable lands, secured them at far better terms. This was possible because the St. Mary's Mineral Land Co., which disposed of 600 acres to the Hancock company, took stock in payment and will participate in the benefits arising from their development.

There have been no developments of importance lately on the Arcadian property and no rich lode has been encountered as reported in some quarters. An examination of the burrow pile shows that both a conglomerate and an amygdaloid have been penetrated in the cross-cut on the 200-ft. level of the new shaft, but no positive value can be attached to either, nor do they furnish any positive identification of the territory. The amygdaloid is not a particularly strong formation and contains very little copper. Talk of "hidden values" in the Arcadian is unfounded. The amygdaloid that was cut in the cross-cut cannot be positively identified and few experts or engineers care to commit themselves in regard to it. By some it is believed to be a northern extension of the Baltic lode, while others say that the distance from the Great Eastern sandstone is such as to make it difficult to correlate with the Baltic. Its identity, however, is of secondary importance. The main question is its copper content, and from the limited amount of work done it would seem that the lode is far from being rich.

It is expected that the Calumet & Hecla will finish the work of erecting a stamp-mill on the Nonesuch property, in the Porcupine Mountain district of Ontonagon county, within a short time. The plant is being equipped with heads of limited capacity and the mill will be used to test the ore from the old Nonesuch mine, on which the Calumet & Hecla company holds a three years' option. The workings of the mine were pumped out some time ago and some of the openings are being extended. Diamond-drill work also is being continued and the property will be thoroughly explored.

The machinery forming part of the additions to the Baltic and Champion mills will be put in place within the next three weeks. The capacity of each addition is to be equivalent to two stamps, that is, 1,400 tons per 24 hours, making 2,800 tons altogether. The addition to the Champion mill is now occupied by an experimental graded crushing system of treating the copper ore; this has a capacity of half a stamp. Further experiments are being made.

In the Trimountain stamp-mill no changes are to be

made. The four heads which are in that plant were recently equipped with the steeple compound cylinders, increasing their capacity considerably, and no further increase in the capacity of the plant is planned for some time.

At the Michigan Co.'s millsite on Keweenaw bay the shaft has been completed; from the bottom of it a drift will be extended under Lake Superior to serve as an intake for the water supply. It was sunk to a depth of 80 ft. The foundation for the stamp-mill is completed, but it is not planned to erect the superstructure until next spring. The mill will contain only one stamp at the start; it will be of the steeple-compound type, but the building will have a capacity for two heads, so that a second one can be added.

Present indications point to important developments in Keweenaw county. A large part of the mineral area of the county is now owned by the Calumet & Hecla, Keweenaw Copper, and Tamarack companies, but a fourth



Montana.

interest is crystallizing. Others are securing options and it is expected that a public knowledge of their plans will be gained within a short time.——Work on the iron and brass foundry which the Calumet & Hecla Co. is erecting at Calumet is progressing steadily. The structural steel has been completed and work can now go forward on the interior of the plant without hindrance from inclement weather during the winter.——At the Superior mine, in Section 15, south of Houghton, the No. 1 shaft has reached the fifth level and the cross-cut at that depth has encountered the Baltic amygdaloid formation about 40 ft. from the shaft. The cross-cut has not penetrated the lode as yet, but from the limited distance already entered, it is apparent that the mineralization at that depth is equally as good as it was at the fourth level. The Calumet & Hecla Co.'s option on the remainder of the treasury stock, which, when added to that company's present holdings, will give it a controlling interest, expires December 31. In view of the favorable showing at the property, it is expected that the Calumet & Hecla will exercise its option.——A large mass of native copper is being extracted from its encasing rock at the sixth level on the Branch vein in the Michigan mine, Ontonagon county. About 28 tons of copper have been cut off from the mass and the end is not yet in sight. A piece about 14 by 18 ft. and six inches thick is now being detached for hoisting. It will weigh 30 tons. There is no way of telling how much more copper remains. The Michigan mine was famous the world over in its earliest days for the masses of native copper which it yielded and they still form a large part of the output. John R. Stanton has arrived from New York and will examine the Michigan and other Lake Superior copper mines with which he is identified.

Butte, Montana.

Wages Increased.—Dealers Raise Prices.—Difficulty Adjusted.—Good News From the Snowstorm.—Operations in North Butte.—Development of the Parrot.—Silver Strike in the Eagle.—Lack of Cars.—Heinze Buys the Stewart.

The scare over rumors of a contemplated strike among the Butte miners to enforce a demand for $4 per day of eight hours for all underground men, has been dissipated by the miners themselves. They will not enforce the demand and have decided to accept the raise of 25c. voluntarily made by the mining companies, which has placed the wages of underground miners at $3.75. As soon as the mining companies announced that a million dollars per annum in additional wages were to be distributed among the 10,000 miners, provision dealers, fuel dealers, liverymen, and funeral directors quickly conceived the idea of getting the biggest portion of the increase. Undertakers increased their rates, the price of coal was advanced 50c. per ton, the liverymen raised the prices of their carriages $1 per funeral. Other living and burial expenses were increased in proportion. Then the miners protested. They said the cost of living had in a few weeks advanced more than the 25c. increase would offset, and a committee was appointed by the Union to call on the managers and request an increase to $4 per day. The miners thought the companies might be able to pay that while copper is selling at 22c. per pound, or near that price, if they could afford to pay $3.50 per day when copper was selling at 9 and 10 cents, and pay dividends at the same time. The mine managers told the committee, however, that no further increase in pay would be granted. Then there were scares about a possible strike and a suspension of prosperity in Butte. At the next meeting of the Miners' Union the committee made its report; the report was received and the committee discharged. Then a motion was made and adopted that the raise of 25c. be accepted and the managers thanked for the voluntary concession. That ended the incident, and everybody in Butte has been praising the miners for their level-headedness and conservatism. The fact remains, however, that the miners are the poorest paid of any laborers in Butte; that they are in the hardest occupation and the most dangerous to health and life. Hod-carriers get $6 per day, and the commonest laborer above ground gets $3. "The rumors about a strike," said President Duffy, of the Miners' Union, "came from irresponsible sources. No strike has been in contemplation. Much dissatisfaction has been expressed over the fact that there has been a raise in the price of almost everything which we have to buy for our households. A committee was appointed to represent to the mine operators that the price of living had advanced to such an extent that it did not seem to us that the increase offered by the companies would be sufficient to cover the increased expenses of living. We want the people to know that the Miners' Union is just as conservative a body as ever and that we may be relied on to conduct matters judicially and rationally."——Frank H. Probert, of Los Angeles, consulting engineer for Thomas F. Cole and engineer for the General Electric Co., has been in Butte for a week or more. He made an examination of the mines of the East Butte Co., and expressed himself well satisfied with the condition of the property, the ore in sight, and the prospects of the company. Mr. Probert also made an examination of some mines in the Corbin district.

The Snowstorm Mining Co., operating at Mullan,

Idaho, in which Butte men have large interests, has installed a new air-compressor with capacity to operate 30 drills. The new Riblet aerial tramway from No. 3 adit to the mill is about ready for operation, and when in working order the company will increase its daily output. It is now mining about 250 tons, which is treated in the leaching and precipitating plant. Some first-class ore is shipped direct to various smelters. Two cars of concentrate were shipped from the mill a few days ago. The assay value of the concentrate was 400 oz. silver and 47% copper. A fine chimney of ore has been opened in the vein on the 500-ft. level. The orebody is six feet wide and has been opened a distance of 40 ft. The ore assays from 21 to 40% copper. Work is about to be resumed on No. 4 adit, which was in 554 ft. when work was stopped several months ago. About 2,550 ft. more will take the adit to the vein, which it will open at a depth of about 2,000 ft. The manager, W. D. Greenough, announces that the next dividend of the company will be paid in January, and that thereafter dividends will be paid monthly.

The Lewisohns, of New York, are sinking a shaft on the Granite Mountain mining claim in North Butte. The property lies between the Edith May and the Jessie of the North Butte Co. and the latter drove three cross-cuts at different levels through the Granite Mountain without encountering any ore. The Lewisohns, however, will sink a shaft 1,500 ft. deep.——A company, called the North Butte Extension, has taken options on six mining claims in an undeveloped part of the district northeast of the North Butte mines. The claims are not an extension of the North Butte, but they lie east of the Berlin group, owned by the North Butte. The Berlin claims are undeveloped and there is no undeveloped property near the Extension claims, although the latter are located in well-mineralized territory. The company has not yet been completely organized, but its promoters are in the East, trying to interest financial men in the project.——The Parrot mine is being vigorously developed, especially on the 1,200, 1,600, 1,700, and 1,800-ft. levels. Sinking has been stopped for the present, but some fine orebodies have been opened on the 1,800-ft. level, and also on the 1,200. Mining is confined almost entirely to the levels between the 1,200 and 1,700, and only about 200 tons of low-grade stuff are being mined daily. The Parrot, however, is looking better than it has for years, and a lot of high-class ore has been blocked out. No mining of it will be done until the development work now under way is completed. The Parrot shaft is down 1,870 ft.—— The Butte & Bacorn Co. has started cross-cuts from the 300-ft. station of the Coleen Bawn shaft for the purpose of tapping the veins known to exist. The company has little expectation of finding commercial ore at that depth. No cross-cutting will be done in the Calumet and Belinda until those shafts reach a depth of 600 ft. The Belinda is now down 550 ft. and the Calumet 540 ft. Three shifts of men are working in each of the shafts, and good progress is now being made. —— A shoot of high-grade silver ore has been struck in the Eagle mine in the east drift of the 200-ft. level, about 165 ft. from the shaft. The ore is 18 in. wide, and assays as high as $340 per ton. —— The mines of the Boston & Montana and several of the Anaconda mines were closed for several days because the ore-bins were full and there were no cars available for transport to the smelters. The sudden cold weather froze the ore on the cars in transit and it had to be thawed out before the unloading was possible. Wrecks both on the Great Northern, and on the Butte, Anaconda & Pacific further delayed traffic.

F. A. Heinze announces that he will take up the option he has held for some time on 620,000 shares of stock in the Stewart mine at Wallace, Idaho, and that he has the controlling interest in the property. The Stewart is one of the most promising mines in the rich Coeur d'Alene district. He secured the stock at 40 cents per share, and it is now selling around $3 per share. —— The announcement is made that the promotors of the North Butte Mountain Copper Co. have succeeded in interesting Eastern capital in their project, and that development work will be started soon. The company owns a lot of locations in the vicinity of the Butte & Bacorn mines north of Butte. —— The Amazon-Butte Co. is making good progress in sinking a shaft on the Amazon claim. A portion of the company's ground has been leased to individual operators who are mining on it. —— Sinking has been resumed on the West Colusa mine by the Boston & Montana Co. The shaft is 1,600 ft. deep, and it is to be sunk 400 ft. further.

Toronto, Canada.

Work on the Gillies Tract.—A New Map of Cobalt.—The Rush Continues.—British Capital Interested.—Work on the Silver Lion.—Portage Bay District.—The Silver Leaf is Sold.—A Mistaken Rush in Saskatchewan.

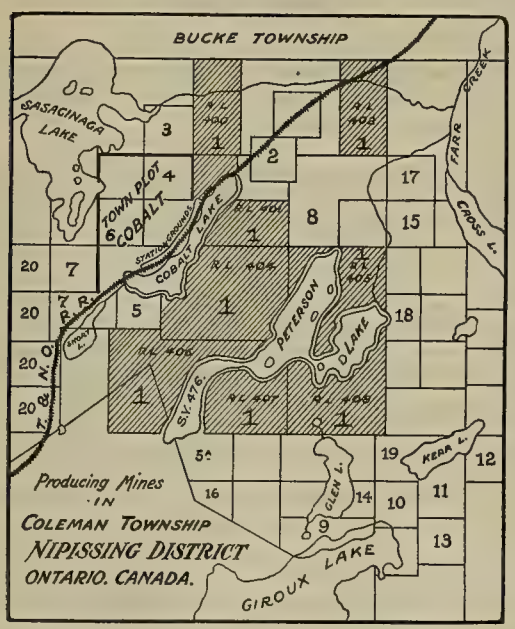
Willet G. Miller has returned from the Cobalt silver district, where he has been directing Government development work on the Gillies timber limit. The first shaft will be completed this week to the depth of 75 ft. according to contract, and a drift into the silver ore will then be commenced. The shaft has been sunk to one side instead of in the vein itself. The professor gives as a reason for this, that the plan pursued in most of the mines of sinking on the vein, will make them difficult to work in the winter, owing to the accumulation of snow in the ditches and trenches. By sinking to one side of the vein it is as easy to work in winter as in summer. Though the samples of ore are rich, Prof. Miller has made no assay, considering that specimens gathered promiscuously from a mine are no criterion of its real value, and preferring to wait until two or three carloads are treated. The shaft on the second vein has just been begun and will only be sunk 25 ft., as the vein does not promise nearly so well as the first. Several other veins have been discovered on the Gillies limit, but only these two will be worked during the winter.

In addition to supervising this work Prof. Miller has been engaged in re-mapping the Cobalt area on a much larger and more detailed scale than has been hitherto done, showing the leading properties, with elevations and contours. The scale will be 400 ft. to the inch, with a horizontal contour of 10 ft. to the inch.——In spite of the advance of the season the rush of investors to Cobalt during the last few days has been greater than ever. The Grand Trunk was forced to run a special train to the north one day this week when a large party came through from New York. The hotels at Cobalt cannot accommodate the visitors.

The Temiskaming & Northern Ontario Railway Commission has advertised for tenders for the mining rights on other sections of the railway right-of-way than those already leased. Three sections are offered for completion; namely, between the 90th and 95th miles; between the 95th and 101st; and between the 105th and 108th miles. The leases will be for 999 years, a cash bonus of $1,000 per mile must be paid, and the output will be subject to a royalty of 25% of the gross value at the mouth of the mine.

A. E. Hitchcock, of London, England, has been visiting Cobalt in company with W. K. George, president of the Foster mine, and it is anticipated that the introduc-

tion of British capital to a large amount may be the result of his inspection.——At the property of the Silver Lion Mining Co., recently organized, about a mile south of Gillies station on the Temiskaming & Northern Ontario railway, a new shaft is being sunk in the vein and buildings are being erected. John Black, consulting engineer, is superintending the work.——There is a great deal of activity in the Portage Bay district in the western part of the Cobalt area and many properties in that quarter have changed hands recently.——The first carload of ore from the Green-Meehan mine has reached the New Jersey smelter and another was shipped last week. There are eleven veins on this property within an area of five acres. No. 1 vein, which has the best showing, varying in width from 3 to 14 in., has been opened up for 350 ft. A considerable amount of ore has also been taken from No. 9 vein in a cut 42 ft. long. The other veins are still intact, as accommodation for employees



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Trethewey Silver-Cobalt Co.
4. Coniagas Mining Co.
5 & 5 A. McKinley-Darragh-Savage.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay Co.

is limited, but since the property changed hands large camp buildings are being erected to provide for an increased force. The purchase by American capitalists of a controlling interest in the Silver Leaf mine, comprising 40 acres in the Kerr Lake district, will result in the complete reorganization of the company and its operation on a considerably more extensive scale than hitherto. The vein so far worked is an extension of the Lawson vein.

The statement that the Ontario Government had been offered $15,000,000 by a strong financial syndicate for the mining rights of the Gillies timber limit is positively denied by Premier Whitney.——Later reports from the West state that the reported gold strike at Birling, Saskatchewan, is without foundation. There was a short-lived rush to that locality, but the only mineral found was iron pyrite.

The Provincial Government is about to offer for sale by tender the right to mine the beds of Cobalt and Kerr lakes. Two sets of claimants recently attempted to locate the bed of Cobalt lake, but their claims were disallowed. Cobalt lake is surrounded by valuable properties, including the Nipissing, La Rose, and McKinley-Darragh-Savage. It is about 50 acres in extent, and four acres have been already sold to the Nipissing Co. The remaining 46 acres is to be offered for tender. Kerr lake is also close to good properties and veins are known to underlie it. The rights to 17 acres have already been parted with to the holders of adjoining locations, leaving 23 acres to be sold. The tenders must be in by December 20.

At the Northern Ontario Consolidated Copper Co.'s property near Dean lake in Algoma district a nice find of copper ore has been made at a depth of 130 ft. It assays 30% copper, together with gold and silver. The company, which now ships its ore to Illinois for treatment, has decided to build a smelter.

Cobalt, Ontario.

Great Speculative Activity.—The Green-Meehan, Temiskaming, and Evans Mines.—Wonderful Development.—New Machinery.—Rich Discoveries.—Widespread Interest in the District.

The term 'phenomenal' has been continually applied to the mining camp of Cobalt from the minute it began to attract attention; it can be truly applied to it today. From every State in the Union and from European countries men are daily coming to Cobalt. Wild speculation has begun and prospects throughout the township of Coleman (six miles square) are being sold at prices ranging from $10,000 to $100,000, according to their position. These in quick order are capitalized at from a quarter of a million to two and a half million dollars. Many of the rich mines cover only 20 acres. The quick transition from a mere prospect to a shipping mine and the possibility of any claim in the township proving valuable, is no doubt the cause of the willingness of investors to pay what otherwise would seem mad prices.

Take the Green-Meehan mine as an example: Two men named Green and Meehan located this 40-acre claim last year. It was then not considered favorably by any mining men in the camp and they prospected it for several months. No profitable results were forthcoming, although they did make a sufficiently good discovery to warrant the Government Inspector passing it as a valid location. When the word went out last September that they had uncovered a vein of calcite heavily shot with silver and five feet in width, the story was received with the utmost incredulity. Investigation proved its truth. An option was given a few weeks after at $250,000, which was a fabulous price to be offered for a claim in the township of Bucke. The property consists of part of Lot 14 in the First Concession, immediately adjoining the Coleman line. The original owners were afraid to disturb the vein, fearing it would prove nothing but a blow-out. The men with the option had no such fear, and, by putting in five blasts, they got sufficient ore, running as high in value as 75% silver, to fill 250 sacks. The day their option expired they were offered $250,000 for their bargain. They formed a company and assumed the ownership on October 23. Last week their first shipment of 20 tons of ore was made and it will run as high as $20,000 per ton. In this short time 11 veins have been discovered and No. 1, from which this shipment was made, has been opened up 358 ft. The rich ore-shoot has been proved for a distance of over 75 ft. No. 9 has produced 12 tons of high-grade ore and this has all come from the surface; nothing but stripping has been done. The other veins are untouched and 90% of the property is still unprospected. A second shipment will be made shortly. All the veins on this and the adjoining property are in the Keewatin series of rocks and are in the same formation as the bonanza veins, No. 49 and

50, on the Nipissing. New buildings are being erected. Fifty men are now employed and this force will be doubled as soon as the buildings are completed. The working shaft, which will be a double-compartment, has been started. A 200-h.p. boiler, steam, and air plant is to be installed before Christmas. Charles A. O'Connell, who has mined on the Mother Lode in California, is the new superintendent. Mr. O'Connell came to Cobalt over a year ago and was with the White Silver Co., operating the Hargreaves mines. They have 300 acres in the township of Coleman but are tied up in litigation with the Ontario Government. The Green-Meehan Co. has refused an offer of $1,500,000 for this property for which, four months ago, no one would have given $50,000.

Adjoining this property is the Red Rock, formerly owned by the Messrs. McMartin, Timmins & Dunlop. This is now controlled by a New York and Pittsburg syndicate, headed by Q. W. Beese. They have a continuation of the Green-Meehan vein, and a new vein has been discovered full of argentite which at surface is as much as five and six inches wide. Some sensational shipments are promised in this quarter too. Nine miles further south in the Portage Bay district a shipping mine, the Evans, has caused a great increase in the values of claims there. Cobalt and the shipping mines O'Brien, Nipissing, Silver Queen, Tretheway, Buffalo, McKinley-Darragh-Savage, and La Rose are about in the centre of a line drawn from the Evans to the furthest shipping proposition in Bucke. The extension of the camp in all directions is now an accepted fact.

The Temiskaming down below Cross Lake is another new proposition whose history while not quite as sensational as the Red Rock's or the Green-Meehan's, has nevertheless been exceedingly interesting. As far back as last May the camp was told that at a depth of 40 ft. a good vein of native silver had been found by two prospectors named Cartwright and Richardson. Their claim had passed inspection and they had a surface vein of niccolite and cobalt. Sinking their shaft right on the vein, it gradually widened and at the 40-ft. level native silver was found. These properties are mentioned by me because they afford undeniable evidences that the area of the rich mineral zone is much larger than originally considered possible. It is true that the number of shipping mines has not materially increased in the past six months. The Green-Meehan and the Evans are the two new ones of recent date. The Temiskaming and Red Rock will shortly be added and there will be a wait probably of some months before any others begin to ship. Deeper development will be necessary in the initial stages but the existence of rich ore deposits is established.

The old mines are increasing their staff and putting in more machinery and installing better plants. At the Foster three steam hoists, two boilers, and a 12-drill compressor from Allis-Chalmers are to be installed and whistles will be blowing in December. A. W. Scott is superintendent here.——At the Tretheway some extra machinery is being ordered.——The Townsite Mining Co. is adding a steam boiler, hoist, and a six-drill compressor and four drills from the Rand-Jenckes. They are sacking ore.——The Right-of-Way Mining Co. is going to make its first shipment next week and some of the ore runs as high as 5,000 oz. silver per ton.

Up the Montreal river at the Edison mine, the superintendent, Horace M. Wilson, reports that they are getting into a good body of ore. They are sinking their shaft right on the vein and are down to 60 ft. The vein is getting wider and they have riders of smaltite six inches wide. A tunnel is being driven from a point in the hillside to strike the shaft at the 60-ft. level which will enable them to run the ore right out and save that 60 ft. of hoisting, as they propose to continue the shaft to a depth of 200 ft. They have a 60-h.p. boiler and an air compressor and three air-drills made by the McKiernan Drill Co., of New York. A visit has been expected from Thomas A. Edison, who owns this property, for several months but it is not likely now that he will be here until after Christmas.——The working developments at both the old and new properties in this camp will be closely followed and reported weekly.

Salt Lake City, Utah.

Local Business.— Interest in Nevada Copper Districts.— The Smelter Smoke Controversy.—Heavy Snowstorms Block Traffic.—Progress at Bingham.—Output of Tintic.—Important Transfer.

Last week's ore and bullion settlements reported through Salt Lake banks reached the total of $741,689.—— A great deal of local interest is being manifested in both the Ely and Yerington copper districts in Nevada. Several new companies have been formed here recently to operate in both camps. Samuel Newhouse and associates have formed the Western Nevada Copper Co. to operate in the Yerington district. In the same locality the Nevada Douglas, of which W. C. Orem, of Salt Lake, is manager, is planning vigorous exploration.

The application of the attorneys of the several smelting concerns, which were defendants in the smoke cases brought before the Federal Court for a re-hearing, has been denied, so an appeal to the Circuit Court of Appeals at Minneapolis has been taken. Pending the settlement of the controversy before that tribunal, the plants will continue in operation as usual, after having given bonds as a guarantee to the farmers against damage. All the smelting concerns affected by the injunction of Judge Marshall are planning to remove to some other site. It is not unlikely, however, that the Utah Consolidated will move its smelter to the camp of Bingham, following the example of the Yampa Smelting Co. —— The fact that the control of the Ohio Copper Co.'s mine has passed to F. Augustus Heinze has been officially announced, but there has been no change in the management, as yet. It is rumored that Mr. Heinze has a call on the Fortuna mine, also at Bingham, yet it is hardly likely that it will be exercised pending the matter of a new site for the smelters at Bingham Junction and Murray.

The Silver King Consolidated Mining Co., at Park City, has closed a deal for the purchase of some adjoining property, which will give this company a territory of 500 acres.——The Daly-Judge Mining Co. is preparing to equip its mine with an electric-haulage system.

Heavy snowstorms at Bingham have put a stop to steam-shovel operations of the Boston Consolidated. This company, as also the Utah Copper, has been using shovels to strip the overburden from the low-grade porphyry ores. ——The Utah Apex Mining Co., of Bingham, is shipping 50 tons of ore to the smelters and this tonnage will be doubled in December, at which time the new aerial tramway will be ready. The tram will bring the ore from the mine to a point in Carr Fork cañon near the entrance to the Parvenue adit, where a large ore-bin has been built. Pending the construction of the spur from the track of the Copper Belt railroad to the bin, ore will be hauled down the cañon to lower Bingham for loading onto the cars of the Rio Grande Western for shipment to the Garfield smelter.——The construction of the mill of the Markham Gulch Milling Co., in lower Bingham, which is owned jointly by the Utah Apex and Utah Development companies, is progressing, and an official of the company states that the plant will be ready within 90 days. The Utah Development Co. is shipping ore to a custom mill in the camp at the rate of 1,000 tons per month.

The United States Smelting, Refining & Mining Co. has secured an option on the West Mammoth and Golden Ray claims, adjoining the Centennial-Eureka mine at Tintic. There are thirteen claims. The development of the ground will begin at once and will be conducted through the Centennial-Eureka mine. The bond price is said to be $162,000.——The ore shipments from the Tintic mining district last week amounted to 154 carloads, the contributing mines and amounts being : Ajax, 5; Bullion Beck, 6; Beck Tunnel, 9; Black Jack, 1; Centennial-Eureka, 47; Carisa, 10; Eagle & Blue Bell, 10; Eureka Hill, 6; Gemini, 10; Grand Central, 6; May Day, 2; Mammoth, 14; Sacramento, 6; Uncle Sam, 3; Victoria, 3; Yankee Con., 7; Tintic Iron, 8; Swansea, 3 ; other mines, 2 carloads.

London.

Record Output in the Transvaal.—Dull Share Market.—The Gold Fields Report.—The Question of Secret Reserves.—Gold Production in India.—Deep Lead Companies. More Capital Required.—Big Undertakings.—Mining on the Yukon.—Much Improved Prospects.

The Boer filibustering expedition into Cape Colony from German West Africa, has made no impression on the Kaffir market. Nothing does nowadays one way or the other. Even another record monthly output—540,609 oz.—has had no effect, except, perhaps, to produce a slightly more hopeful feeling with regard to the future. The adverse causes still existing in the Transvaal are strongly reflected in the Consolidated Gold Fields' annual report. Owing to the severe and sustained fall in South African stocks, the directors state they have had to make provision for depreciation in respect of some of the company's investments which stood in the books at a cost in excess of their market quotation. The realized net profit on the year's operations, which is largely derived from dividends received on investments, after deducting debenture interest and all outgoings, shows a balance to credit of £409,469, from which the dividend on the preference shares, income tax and French Government taxes have been provided, leaving £323,240, which, added to the sum of £934,687 brought forward from last year, produces £1,307,928. From this the directors have made provision for the depreciation referred to above, amounting to £700,000, leaving £607,928 to be carried forward to the credit of the current year's profit and loss account. Investments stand in the books at average cost or under, and all shares are taken into account at prices below those current at the date when the accounts were made up, and show on current prices a further large unrealized profit. The directors consider that had the outlook, as regards unskilled labor been free from doubt, they could have safely recommended a distribution; but until all doubts are removed as to an adequate supply of unskilled labor, more particularly in the case of companies having commitments in respect of debentures for which the Gold Fields company has assumed liability, they hesitate to recommend a course that would diminish the company's cash resources. Should, however, the policy of the Transvaal Government, as regards unskilled labor, dispel this doubt during the current fiscal year, and be authorized by the British Government, they would consider themselves fully entitled to distribute an interim dividend.

Incidentally, the 14,968 oz. included in the Transvaal output for October from mines which have abandoned the 'equalizing system' may be mentioned as a step in the right direction. The hope may be expressed that the practice of 'secret reserves' will be dropped by all self-respecting companies. All well-established mines, that is to say, those possessing ore reserves blocked out for a recognized period in advance of the ordinary milling capacity, can afford to publish the true month's yield of precious metal and show the fluctuations inherent to the character of each mine respectively. Any other course is a proof of pandering to Stock Exchange vagaries which should not be allowed to come within the scope of a mine manager's functions. What would be thought of an executive at the head office in London who adopted the practice of locking away a large sum of cash out of sight from the company's auditors so as not to include it in the assets at the end of the financial year? This may be thought perhaps as putting the case too strongly, but what is wrong for a public company's officials at one end cannot be right for those at the other. Besides, in the event of discovery, public confidence, at best not overstable in the matter of mining, receives a shock. Not so very long ago a leading gold mine's return for a given month was found to show an important increase on the usual average. A scramble for the shares ensued, with the result that when the 'secret reserve' cat was let out of the bag much lurid language was let loose on the particular management, and mining methods in general came in for scornful denunciation.

The news from Loddon Valley Goldfields is somewhat disconcerting to stockholders who expected by this time to learn that payable wash had been reached. According to a report from the general managers it appears that the wash has been entered about 25 ft. to the west of borehole No. 67. The bedrock at this point is smooth and hard, and dips at a high inclination—upwards of 45° east. They are also opening up at borehole No. 81, and will enter there in about a fortnight; they are also driving north from borehole No. 70. The water has not given any trouble. The steep dip of the bedrock at the point entered indicates that the auriferous channel lies further to the east, and that it will not be possible to form any judgment of the value of the wash until the work in progress in this direction has been done. Immediately following on this deferring of hopes in the case of Loddon Valley, the circulars issued by the boards of the Victorian Deep Leads, and the Moorlort Goldfields, announcing reconstruction schemes with a view to the provision of further capital for the energetic conduct of pumping operations, have not been welcomed with enthusiasm by the market. In the case of the Victorian Deep Leads, the new company is to have a capital of £400,000. The shareholders in the old company are to receive 200,000 shares, or five shares in the new company for every eight shares in the old company; 100,000 further shares in the new company are to be issued at par, and shareholders have the right to subscribe *pro rata* for these shares, according to their holding. The remaining 100,000 shares are to be kept in reserve for future issue. The new Moorlort Company is to be formed with a capital of £275,000. Shareholders are to receive 100,000 shares, or five shares in the new company for every eight in the old company; 100,000 further shares in the new company are to be issued at par, and shareholders are to have the right to subscribe *pro rata*. The remaining 75,000 shares are to be kept in reserve for future issue. In both cases the issue of the new capital to be paid for in cash has been guaranteed in consideration of an option on the reserved shares. Loddon Valley Goldfields, Ltd., has itself a capital of £240,000 in £1 shares fully paid. The area owned covers 5,680 acres. Another of the Victorian deep-lead companies under the management of Messrs. Bewick, Moreing & Co. is the Australian Commonwealth Trust, with a capital of £250,000 in £1 shares, formed to undertake financial and other business and to secure co-operation in the development of deep-lead mining. Interests have been acquired in the

Berry United, Great Berry, Loddon Valley, Moorlort, Option Blocks, and Victorian Deep Leads. The company owns the Avoca and Archdale leases, comprising nearly thirty miles of lead, and the country adjoining the Victorian Deep Leads to the north for a run of about ten miles. It is entitled to 20% of the profits of the Loddon, Moorlort, and Victorian companies for about ten years and has the right to float off subsidiaries of the Victorian Deep Leads, Ltd. The Consolidated Deep Leads, Ltd., with a capital of £200,000 in 4s. shares, fully paid up, is in the same category. The area owned covers 2,500 acres, known as the Option Blocks, but the company is interested in the Loddon Valley and Moorlort companies, in both of which it has substantial holdings, as well as in the Australian Commonwealth Trust. The length of the property owned by the company is about two miles.

Cripple Creek, Colorado.

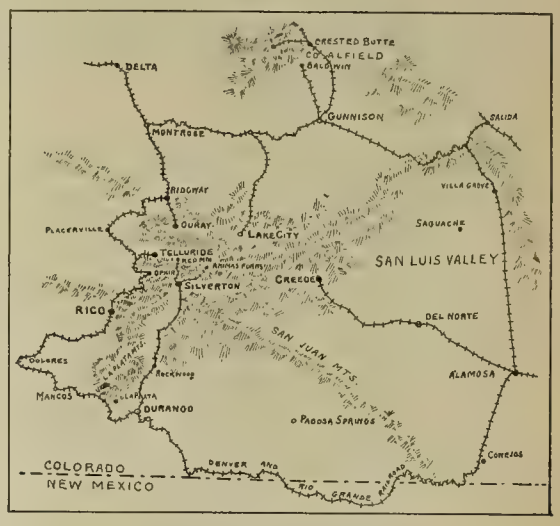
New Air Compressors.—The Drainage Adit.—Financial Support for It.—Strikes in the Aileen and Longfellow.—A Flat Vein in the Rebecca.—Aerial Tramway.—Several Interesting Developments.

The 10-drill compressor ordered from the Chicago Tool Co. by the Bull Hill Mining & Development Co. for use on the Cresson mine, on Raven hill, has arrived in the district and will shortly be ready for use. This compressor is to be run by electricity, the motor being already on the ground.——A new 30-drill compressor is soon to be put in by the El Paso Gold Mining Co. on Beacon hill. This piece of machinery is to take the place of three 10-drill compressors, which are now in use.——The Smith & Altman lease on the Doctor-Jack Pot mine is shipping a good tonnage of ore from the new strike on the 700-ft. level. Returns as high as five ounces in gold have been obtained.

The old stopes on the 100-ft. level of the Wild Horse mine, situated on Bull hill, of the late United Gold Mines Co., are being gone over by Thos. Reynolds, who has obtained them under lease. Rich ore was shipped from these stopes in the past, and Reynolds is obtaining a small tonnage of very rich stuff by picking and sweeping. On the 500-ft. level of the same mine, Oscar Fogelman & Co. is shipping ore from a 12-in. streak, which gives returns of two to three ounces.——The Colorado State Investment Co., operating the Aileen mine on Guyot hill, is shipping ore mined from the 600-ft. level. The average returns run in the neighborhood of an ounce, but the last car was of a better grade, yielding over $40 per ton.

It has now been practically settled that the deeper bore, or Window rock scheme, will be chosen for the new drainage tunnel for unwatering the mines of the district. The Strong Gold Mining Co. is said to have come in and is willing to subscribe to the drainage project. Liberal subscriptions have also been promised by the Golden Cycle Co., representing also the United Mines Co., as well as the Stratton Estate and Ophir mine, the latter having come into much prominence of late. The water in the Gold Coin shaft of the Granite Co., where pumping was stopped not long since, is rising gradually and is now above the 1,000-ft. level, cutting off all work below this. It has also risen in several of the adjacent mines, and goes to show that a drainage adit would be of great service to such properties as cannot afford to continue their pumping operations.——A good vein has been encountered at a depth of 300 ft. in the Midnight shaft of the Longfellow claim. This claim belongs to the Stratton Estate, and is situated on the south slope of Bull hill; it is being operated by the American Leasing Co. It is supposed that this vein is an extension of that which has produced so well of late in the Specimen and Sacramento claims, under lease to the Western Investment Co.——Promising results are being obtained by B. Von Phul and partners, who are operating on the Fairchance claim on Gold hill. These men are sub-leasing from J. C. Kellogg, who has this property under lease from the Vanderbilt Estate.

Good ore has been encountered on the Rebecca mine at the head of Poverty gulch. Brown, Hill & Winters are working at a depth of 250 ft. through the fourth level of the C. O. D. shaft. It is a flat vein, averaging nearly 3 ft. wide. This strike was quite unexpected, being made while cross-cutting for a perpendicular vein cut some months ago in a 40-ft. shaft west of the C. O. D. shaft. The latter vein should be cut within 10 ft., and it is hoped that at the junction of these two veins rich ore may be obtained.——J. W. Price has sold his interest in the Price-Waters lease on the Last Dollar mine, situated at the foot of Bull hill, to J. H. Waters. Work will be carried on as usual and regular shipments made as before. The lease is said to be making good money.——An aerial tramway is nearing completion, from the ore-



Map of Southwestern Colorado.

house at the entrance to the Moffat tunnel to the F. & C. C. Railroad, a distance of about 1,000 ft. It is to handle the output of the Little Clara claim of the Work property, and will have a capacity of approximately 160 tons per day. The siding at the terminal will accommodate eight narrow-gauge freight cars.

Operations have been resumed on the Jo Dandy mine on Raven hill. A 30-ton car of ore is being shipped every day to the Standard plant at Colorado City. J. P. Snyder, T. E. Fuller and associates, leasing between the 200 and 400-ft. levels of the Davenport shaft of the Doctor-Jack Pot Co., have struck some good ore. An 18-in. vein has been encountered on the lower levels, from which assays up to as high as five ounces have been obtained.——The Standard Development Co., operating in the South Burns of the Acacia Co. on Bull hill, has encountered some rich ore in a stope on the 800-ft. level, situated 50 ft. north of the shaft. The vein varies from one to three feet wide, showing sylvanite and rusty gold in several places. Three cars per week are being shipped from this lease, giving returns from $20 to $50 per ton.——Another promising strike has been made on the Black Jack property operated by the Union Leasing Co. Cross-cutting has been going on for several months at a depth of 400 ft., and the vein now cut is thought to be an extension of the Lonaconing.

Personal.

D. A. LOUIS is in Egypt.

THEODORE DWIGHT is at Guanajuato.

BERNARD MACDONALD is visiting New York.

L. M. TERRY has returned to New York from Mexico.

ROWLAND C. FIELDING is examining mines in Colombia.

H. W. EDMONDSON is now at Aguatos, in Chihuahua, Mexico.

I. ROSKELLEY has left Johannesburg and is now at Truro, in Cornwall.

CHARLES A. GREEN visited San Francisco from Mill City, Nevada.

HENRY E. WOOD, of Denver, is on a visit to Siskiyou county, California.

R. H. CHAPMAN, of the U. S. Geological Survey, is at Las Vegas, Nevada.

WALTER H. WEED is examining mines in British Columbia and Alaska.

F. W. GREY, manager of the Hutti gold mines, in India, is in England on leave.

DAVID H. LAWRANCE, of Denver, is examining mining property in the Black Hills.

H. C. BAYLDON has been appointed manager of the Troitzk gold mines, in Siberia.

HUDSON H. NICHOLSON, of Chicago, has returned to Nevada, on professional business.

JAMES W. MALCOLMSON has finished his examination of the Sirena mine, at Guanajuato, Mexico.

DONALD F. CAMPBELL is engaged in the examination of the Bighorn mine, in southern California.

C. COLCOCK JONES has returned to Los Angeles from two months' professional work in Idaho and Utah.

JOHN M. BECKWITH has arrived at Buenos Ayres, where he is manager for the General Mining Company.

F. W. BOSCO has resigned as superintendent of the Mogul mill near Silverton, Colo., and returned to Denver.

PHILIP ARGALL and JAMES A. MCCLURG, of Denver, visited San Francisco on their way from Arizona to Nevada.

ALTON L. DICKERMAN is examining mines in the San Juan region of Colorado. He will proceed shortly to Cobalt, Ontario.

C. W. MACARTHUR has returned to Denver from Silverton, where he had charge of construction work at the Gold Prince mill.

FRANK H. PROBERT is examining mines at Butte, Montana. He will return to Los Angeles during the early part of December.

VICTOR G. HILLS has been examining tungsten properties in Boulder county and doing professional work at Central City, Colorado.

E. S. WARD and W. S. BROWN have opened offices at 417 Boston Bdg., Denver, where they will do consulting and engineering work.

MARK L. REQUA has resigned as president and general manager of the Nevada Consolidated Copper Co. and POPE YEATMAN succeeds him.

FRANK P. SWINDLER has been appointed general superintendent of all the Utah mines which F. Augustus Heinze controls. This includes the Bingham Con., as well as the Western Utah Copper Co., in the Deep Creek district.

ROBERT MCF. DOBLE, of Colorado Springs, formerly of Francisco, has been retained as consulting and supervising engineer by Curtis & Hine, general managers of the recently organized Central Colorado Power Company.

W. R. WARDNER has been appointed general superintendent for the Bamberger De Lamar Gold Mines Co., at De Lamar, Nevada, succeeding GEORGE E. METZ, resigned. Mr. Wardner was formerly superintendent for the Mono Mining Co., at Yreka, California.

Obituary.

R. G. HART, one of the best known mining men and operators in California, died in the City of Mexico on Sunday morning, November 18, the body being shipped to his home in Berkeley. Mr. Hart for many years operated the Texas and Georgia mines, now known as the Texas Consolidated, at Old Diggings, Shasta county. He was the original operator of the Bullychoop and the Central mines in the same district, in which properties he is reputed to have lost a fortune. He was a brother-in-law of W. J. O'Donnell, of the Quartz Hill mine, near Redding, the two having married sisters. Deceased was a native of Cornwall, England, and a mining engineer of some repute. He was approximately 70 years old at the time of his death, and leaves a family of grown children, by his first wife.

Commercial Paragraphs.

THE LANCASTER FORGE & BLOWER CO., of Buffalo, N. Y., has issued a 20-page folder describing their blacksmith equipment.

THE WELLMAN-SEAVER-MORGAN CO. has issued an attractive booklet illustrating the scope of its business in mining and power machinery.

THE SULLIVAN MACHINERY CO. issues Bulletin 51–D, describing their pneumatic hammer-drills, as used for quarrying and contracting work.

THE main sales office of THE MIDVALE STEEL CO. is now at the corner of First and Folsom St., San Francisco. This office will be retained until the Rialto Bdg. is reconstructed.

JOHN A. TRAYLOR MACHINERY CO. is moving its offices from Blake St. to 17th & Glenarm St., opposite the Denver Club, in the building recently occupied by the C. W. Knox Machinery Company.

THE BUFFALO FORGE CO., of Buffalo, N. Y. has received a large order for a complete forge shop equipment to go to Samatra. All the forges will be equipped with the downdraft smoke-exhaust system.

THE INGERSOLL-RAND COMPANY, of New York, issues Bulletin No. 2,011, describing the Little Jap hammer drill. This machine has become widely used for the lighter work of rock excavation, both at surface and underground.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, November 28.

Argonaut	$4.70	Furnace Creek	$4.00
Con. Virginia	1.32	Savage	1.25
Mexican	1.10	Sierra Nevada	1.00
Ophir	2.90	Yellow Jacket	1.05
Belmont	6.50	Montana	3.75
Jim Butler	1.45	Mohawk	16.40
Jumbo	4.05	Red Top	4.05
Jumping Jack	0.55	Sandstorm	0.86
Manhattan Con	1.00	Silver Pick	2.15
Midway	2.45	Tonopah Ex	6.65

ANGLO-AMERICAN SHARES.

Cabled from London.

	November 22. £ s. d.	November 28. £ s. d.
Camp Bird	1 9 0	1 8 9
El Oro	1 7 9	1 7 6
Esperanza	2 13 0	2 18 9
Dolores	1 12 6	1 12 6
Oroville Dredging	1 1 0	1 1 0
Stratton's Independence	0 3 6	0 3 3
Tomboy	1 12 6	1 12 0

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Closing Prices— November 22.	November 28.
Copper—Lake (cents per lb)	22¼ @22½	22⅛ @22⅛
" Electrolytic "	21.65@22	21.85 @22.10
" Casting "	21½ @21¾	21.75
Lead "	5.75	5.75
Spelter "	6.38@6.43	6.40 @6.45
Silver (cents per oz.)	71¼	69⅜

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

FOR the pins used in the buckets of dredges, manganese steel has proved to be best.

POWDER should never be taken into mines on cars propelled by electricity. In case of a wreck the live wires are apt to come in contact with, and set off, the powder.

STIBNITE, the antimony sulphide, has been found deposited by the hot waters that permeate the gravel at Steamboat Springs, Nevada.

THE old mining districts of Pachuca and Real del Monte in Mexico resemble, in a geological way, the goldfields of Tonopah and Goldfield.

THERE are grounds for believing that beneath the Tertiary volcanics of Tonopah, there is an older formation of Paleozoic limestone and intrusive granite.

THORITE, the silicate of thorium, recently found in quantity in Ceylon, is likely to replace monazite as a source of thoria. It occurs in small brown cubes resembling altered pyrite.

IT IS PROBABLE that the mineralizing agents that made the ore at Tonopah were thermal waters, such as are usual among the after-effects of volcanic action; also that they were hot and ascending.

THE custom of debiting mining machinery to capital account so as to increase apparent profits is like transferring money from one pocket to the other, in the confident belief that there has been an increase of receipts.

THE most important veins of the Tonopah district are in the early andesite and do not extend into the overlying rocks. Where the early andesite is not exposed at the surface, the later rocks form a capping to the veins.

UNDER CERTAIN CONDITIONS, the rate of dissolution of gold by chlorine and bromine is reduced by the addition of 10% of silver to the gold, and the action is almost stopped when the silver amounts to 30 or 40% of the alloy.

WHERE compressed air is carried through pipes into a mine, it should be remembered that in case of fire these pipes can be utilized to carry water. Also, in case of an explosion, it is sometimes possible for the men to secure air through the pipes.

VOLCANIC ACTIVITY lasted in Nevada from the beginning of the Tertiary period to within a few hundred years ago, but many of the hot springs which accompanied or followed the different manifestations of volcanic activity are now extinct.

KAOLIN OR CHINA CLAY is a decomposition product, particularly from orthoclase feldspar. It is obtained by washing a variety of decomposed, and often disintegrated, granite. In Cornwall, deposits of this mineral have been found to exceed 900 ft. in thickness.

THE apex law has not been repealed. A lode-locator may follow his vein downward outside of and beyond his side-boundaries within his extended end-line planes, provided, of course, the apex is found crossing his lines in such a way as to confer upon the locator that privilege.

MONAZITE is an anhydrous phosphate of the rare earths of the cerium group, but it usually contains also a variable amount of thorium, and it is this element that gives the mineral its commercial value. When separated, the thorium oxide is used to saturate the cotton mantles of incandescent gas burners.

DELICATE speed-regulating apparatus is required when a dynamo is geared direct to a windmill. In a new system, the windmill pumps water into a hydraulic accumulator, and water from this (kept by automatic valves at a pressure of 75 lb. per square inch) drives the dynamo. A storage battery saves the surplus power in the usual way.

THE ozokerite deposits of Utah occur in shales, shaly sandstone, and limestone strata at the north end of the Wasatch plateau. It is a mineral wax; it cuts easily, somewhat like hard cheese, but does not adhere to the knife. It is usually black, with yellow resinous parts. It melts between 54 and 70° C. and is completely soluble in boiling ether.

AT JOACHIMSTHAL, in Bohemia, now celebrated for its uranium ores, the best veins are in a dark, biotitic, feldspathic, rarely garnetiferous, often carbonaceous, schists, rather than in the pale muscovitic or garnetiferous rock. These mica schists are traversed by dikes of porphyritic granite. The uranium ore is mainly pitchblende, occurring in quartz and dolomite.

ASSESSMENT WORK must be done on, or for the benefit of, each claim each year. When several claims are held in common and are contiguous, work may be done on one of them on a main shaft or tunnel, provided that method obviously tends to develop all the claims in the group. As to whether a given method of working will or will not tend to develop all the claims in a group, depends upon local conditions. It is safer to do the work on each claim. Where work is done, however, on one claim for the benefit of several, the aggregate amount must be the equivalent of $100 for each claim; for example, if the group consists of five claims, $500 must be expended in improvements.

A GAVE permission to *B* to place an arastra on his ground and operate it, using water belonging to *A*. Subsequently *B* quit operations, leaving the arastra on the ground. *A* wishes to know if *B*, by placing the arastra there and using the water, acquired any right to the land or water, or if *B* can now resume the use of the arastra without *A*'s consent. There was no written lease or understanding as to length of time *B* was to enjoy the privilege. The transaction amounted simply to a verbal license, revokable at the will of *A*. *B* acquired no permanent rights on *A*'s land or in the water. If *A* notifies *B* that the privilege is revoked, *B*'s rights cease. He would, however, probably have the right to remove the arastra within a reasonable time after notice.

THE tolerance of heat shown by Europeans in Central Australia appears to give some support to Sambon's theory in regard to acclimatization. Sambon holds that there is nothing to prevent Europeans living and working as well as any black race in the hottest of tropical localities. He maintains that the supposed unsuitability of the tropics for European settlement is due to disease and not to climate, and that as the special tropical diseases are due to germs, they may be cured or prevented when the life histories of the germs become known. As a matter of fact the climate of subtropical Australia, with its exceedingly low humidity (in the interior) and its wide annual range of temperature, is quite unlike that of such regions as West Africa and the Philippines.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Standardization of Screens.

The Editor:

Sir—The principal novelty in the report of the South African committee on the standardization of screens, consists in taking a series of arbitrary size apertures and an irregular number per inch, so that wires of varying diameter and varying number of apertures per inch will (in the 12 examples given under each standard aperture), give with each size wire the particular aperture called for.

Secondly, 'aperture' is everywhere used for the obnoxious and ambiguous 'mesh,' this being in accordance with my article in *The Engineering & Mining Journal*, November 7, 1903.

Lastly, no mention is made of other workers in this field. You yourself have been an early writer on the subject. The Institution of Mining & Metallurgy has done some good work along these lines, although I started in to correct the evil 23 years ago. When I found in Cornwall as many standard gauges as there were battery screens, I took the most rational gauge, which happened to be that of J. & F. Poole, of Hayle; measured it, and published the results in the *Proceedings* of the Mining Institute of Cornwall, 1883, page 344. This Poole standard Cornish gauge for perforated plate was numbered from 1 to 40. No. 1 aperture was 0.25 in. diam.; No. 10, 0.70; No. 20, 0.105; No. 30, 0.055, and No. 40, 0.01 in., the last being the finest perforation then attainable. The wire gauge used in the published tables of the South African committee is the Imperial Standard, and for illustration one cannot do better than re-produce the complete table for 0.030 aperture:

APERTURE = 0.030 IN. = 0.762 MM.

Wire.		Apertures per inch.		Per cent discharge area.
Imperial gauge	Diameter in decimals of an inch.	Linear	Square	
21	0.032	16.13	260.11	23.41
22	0.028	17.24	297.22	26.75
23	0.024	18.52	342.92	30.86
24	0.022	19.23	369.83	33.285
25	0.020	20.00	400.00	36.00
26	0.018	20.83	434.02	39.06
27	0.0164	21.55	464.49	41.80
28	0.0148	22.32	498.23	44.84
29	0.0136	22.94	526.06	47.34
30	0.0124	23.59	556.25	50.06
31	0.0116	24.04	577.83	52.01
32	0.0108	24.51	600.74	54.07

No.	Inch.	No.	Inch.	No.	Inch.
1	0.250	15	0.128	28	0.060
2	0.230	16	0.125	29	0.058
3	0.225	17	0.117	30	0.055
4	0.220	18	0.114	31	0.050
5	0.210	19	0.110	32	0 040
6	0.200	20	0.105	33	0.035
7	0.185	21	0.100	34	0.032
8	0.180	22	0.095	35	0.030
9	0.175	23	0.090	36	0.028
10	0.170	24	0.085	37	0.025
11	0.160	25	0.075	38	0.020
12	0.150	26	0.070	39	0.015
13	0.140	27	0.065	40	0.010
14	0.135				

From which it will be seen that 12 wires of different gauge varying from 0.032 in. diam. to 0.0108 in., will each when spaced give from 16.13 to 24.51 apertures per linear inch (depending on the gauge used), and leave apertures of 0.03 inch. It will be further noticed that in the whole table for the 0.03 inch aperture there is but one even division of the inch, namely, No. 25 wire, with 20 apertures per linear inch. The arbitrary division of the inch into an irregular number of apertures, nearly all carrying two places of decimals, does not look practical nor is it necessary. A slight variation in the exact size of aperture is of no particular moment except in testing screens.

The Washburn & Moen gauge, the American standard, with an even number of apertures to the linear inch, for example, gives the following:

Number of wire	Apertures per inch.	Size of aperture.
21	16	0.0308 in.
23	18	0.0298 "
25	20	0.0296 "
29	22	0.0304 "
33	24	0.0299 "

All of which are sufficiently close for any practical purpose. Great exactness in battery-screen apertures is an unnecessary refinement, inasmuch as screens are subject to continuous wear, thus a standard 0.02-in. aperture screen may become 0.03 in. after a few days' run, and the average aperture for the period may approximate 0.025 in. For what are called laboratory screens, however, the greatest possible exactness attainable should be insisted upon, and all weekly or monthly battery samples should be treated wet in these standard screens and so reported; by this means the exact work of the batteries can be closely approximated and the reduction of the ore determined with scientific precision, not alone for the maximum aperture, but also for the intermediate sizes; thus, a battery crushing approximately through 0.02-in. aperture might be reported

+ 0.02 "	+ 0.0025 "
+ 0.01 "	+ 0.002 "
+ 0.005 "	— 0.002 "

I have called attention to the use of these standard testing screens, which I invariably use as standards, in my paper on 'Dry Crushing,' read before the Institution of Mining and Metallurgy, London.

PHILIP ARGALL.

Denver, November 2.

The Need of Experience.

The Editor:

Sir—There were three mining graduates—one each from three of the best mining schools in the country—who were employed at the B mill in M county, Arizona. One was acting as consulting engineer, and at the time of the incident was the superintendent also. Another was running the mill, and the third the cyanide plant. The millman was off for a few days, and Mr. N., one of the men at the mine, who claimed to be a millman of some experience from Douglas Island, came down to run the mill. He made some changes, some of them for the better; and he talked so well that he got the complete confidence of the superintendent.

At clean-up time the regular millman was back, and Mr. N. remained to help in the clean-up and give what pointers he could. After the plates had been given their regular cleaning, he did not think they were cleaned close enough and stated that he could get 200 oz. more off the plates. The superintendent (and consulting engineer) finally agreed to give him so much per ounce after the first 100 ounces.

He sent for his partner, who was at the mine, and both went to work at the plates with blocks of wood, sand, and quick. They cleaned up the 200 oz. and then some more, and made good wages that day. The amalgam was fine-looking, and the superintendent was jubilant. That night the retorting was done by the cyanide man, and when it was opened, there was scarcely anything left. The cyanide man was accused of heating it too hot, and boiling it over with the quick. The quick was then squeezed, but there was nothing there. Next morning the consulting engineer and millman retorted some more of it with the same result. It was then tested and found to be mostly copper. It is needless to say that the plates

were pretty well scoured to the bare copper and in pretty bad condition.

Of the three mining graduates, not one of them knew enough about the care of plates to know that anything was wrong until it was too late. It simply shows the need of experience for the mining graduate as much as the non-graduate.

E. D. C.

Terry, S. D., November 11.

[The young men mentioned must have been unintelligent. Any course of lectures on the metallurgy of gold would include a description of amalgamating plates and the care of them. Graduates or non-graduates who go into a stamp-mill without reading the books available on that subject are just plain chumps.—EDITOR.]

Debris Dams for Conserving the Water Supply.

The Editor:

Sir—In taking a trip up one of the narrow southern California cañons one cannot but observe the enormous erosion that is taking place during the rainy seasons, and especially after the frequent summer rains that often assume the dimensions of a waterspout. Perhaps the latter have a more scouring or eroding effect than the winter rains on account of the lack of protection that is naturally given by the immense snowfields, and the fact that the winter rains, while the aggregate volume is great, the precipitation is so gentle that comparatively there is little erosion in the higher altitudes.

Before the wholesale destruction of the timber in the mountains, this erosion did not take place to any such great extent, though of course even then immense quantities of debris swept out of the mountains after every heavy rainfall.

There is no need in this letter to bring out the usual points in favor of the preservation of our forest area, except to call attention to the great importance that accumulations of debris had in the matter of conserving the water supply by the storage furnished by immense gravel beds that allowed the water to percolate out gradually, averaging the flow and to a certain extent lessening the destructiveness of the annual floods that sweep down the mountain streams. This was naturally brought about by the accumulations of fallen timber, roots, etc., which in their turn held boulders, gravel, sand, and silt, checking the top flow by the area of the underflow and this again aiding in the accumulation of debris until a mean was reached proportionate to the heaviness of the timber growth. The writer is of the opinion that this natural result from a heavy growth of timber has a greater effect in conserving and regulating the water flow than any other feature to be considered in favor of forest growth as of paramount importance to the irrigationist.

Many causes aided nature in the accumulation of debris, fallen trees, limbs, etc.; snowslides, windstorms, and landslides all added to the accumulations in the narrow cañons of our lofty mountains. Nor can it be said that this effect was merely local, as would be the case were the debris held back as water is behind a dam; rather, the debris would assume practically the grade of the cañon, except where the fall was precipitous. This will explain the anomaly why heavy growths of brush on the mountain-sides do not conserve the water in anything like a proportionate ratio to a growth of heavy timber, although undergrowth possibly furnishes a better protection to the soil underneath than a heavier growth of trees.

The flow of water through gravel beds is known to be very slow. In some places, as in the San Fernando cañon, near Los Angeles, tests show the travel to be no more than a mile per year, thus providing a flow that is scarcely affected by years of drought, at the same time reducing the amount in seasons of flood by taking the excess and holding it in suspension in the beds of gravel. The importance of these immense deposits of gravel, in favorable situations, is well known in the irrigation problem; the only point we wish to consider is the practicability of adding to and conserving our water supply by means that are within our reach, the expense of which would not be prohibitive.

This brings us to the debris dam. By this I mean the dam that is commonly used by the hydraulic miner in the northern parts of the State for the purpose of impounding the debris with the object of preventing the filling up of navigable streams and the causing of overflows by the blocking of the channel. It is claimed by some that they have but a minimum effect in this regard, but even this does not lessen their importance as a means of providing an artificial substitute for previous natural conditions in restraining debris and insuring a better and more regular water supply. It is generally conceded that our present water supply is only going from bad to worse, and that the scouring that is taking place will ultimately result in its being limited to the melting snows and the storage capacity of our reservoirs. Hence the importance of this subject.

The ordinary debris dam, of which numerous illustrations have from time to time been published in the MINING AND SCIENTIFIC PRESS, is possible of being constructed cheaply, yet owing to the interlocking nature of the filling that takes place behind, it becomes practically indestructible, and can be added to as the conditions require. It is usually built of logs or poles, the small end of the tree being placed up-stream so as to be first buried in debris, thus locking it in position. These are usually nested in the cañon, all lying one way, no means being taken to tie them together, and usually with a slight slope on the lower end to break the overflow and prevent cutting by the waterfall. Where timber is scarce these could be built in a modified crib shape, yet it would be necessary to have a sufficient number of trees of full length extending up-stream to insure holding. Not having the advantage of a hydraulic stream, it would be necessary to use a layer of heavy boulders to hold these until the natural flow of debris had filled in behind and over them.

Favorable sites could be selected for such debris dams. Nor is it essential to secure great height; rather, it would be more practicable and cheaper to make as large a number of these dams as the conditions justify, of a moderate height, with the intention of adding to them or interspersing more dams between them from year to year.

Where a road runs up these cañons it would be necessary to build a new one over or around the dam, changing the road from time to time as the conditions demanded, with possibly less annual expense than where the cañon is allowed to cut out at will.

Power companies would certainly co-operate in a matter so vitally affecting their interests and in most cases could be expected to take the initiative.

This field offers a possible practical solution of the question of conserving our water supply for the future; or if carried out in a thorough manner to go even further and increase the water supply in years of drought, speaking conservatively, 25, 50, or 100 per cent.

A. E. CHAPMAN.

Redlands, Cal., October 31.

MEXICO is trying to solve the labor problem by importing Japanese. About 1,000 have been brought in, and 2,000 more are to come. Most of those who have been in the country some time marry Mexican women.

Devices for Shaft-Sinking.

Written for the MINING AND SCIENTIFIC PRESS
By DONALD F. CAMPBELL.

A convenient arrangement of doors to protect the top of a shaft in sinking is shown in the accompanying illustrations (Fig. 1, 2 and 3). By this simple system of levers and counter-balances, one man can easily raise both doors simultaneously, and lower them immediately the bucket reaches the surface. The car is then run over the doors, and the bucket emptied. By this means extraction of

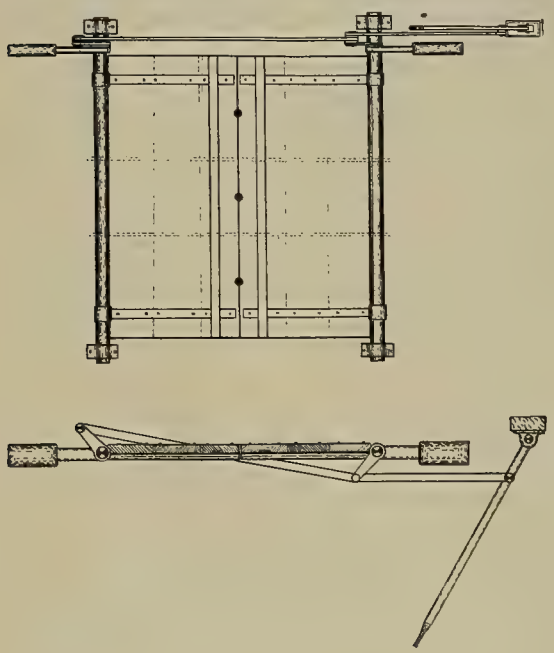


Fig. 1.

waste is facilitated and the safety of the miners increased.

In the case of deep shafts, a great deal of time is unnecessarily wasted owing to the slow speed of winding. A big saving can be made by the use of a system of guides (Fig. 4). Wire ropes are made to pass over two pulleys at the top of the shaft, parallel to the winding



Fig. 2.

pulley, and are attached to a platform, which serves as a timbering stage and is raised or lowered as required. The guiding apparatus consists of a cross-bar having a round hole in the centre, through which the rope passes. It has two legs with holes at the top and bottom to receive the guides. This rider descends with the bucket to the stage, which is usually ten yards from the bottom, and below this it continues unguided. As the bucket is again wound up, the rider is caught up again on a collar at the bottom of the rope, to which a rubber buffer is attached to reduce the shock.

GOLD DEPOSITS OF THE SOUTH.—One great cause of the lack of success which has attended gold mining in the Southern Appalachians lies in the fact that instead of one recognized and well-defined type of gold deposit, as is the case in most mining districts, there are various types exhibiting a very wide range in character, and individual mines present more and greater differences than sim-

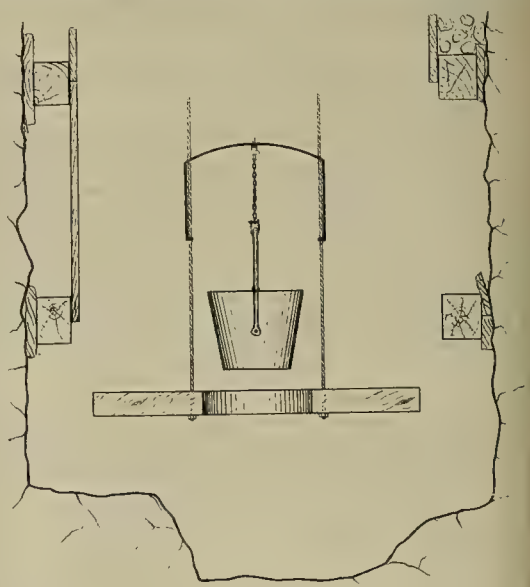


Fig. 4.

ilarities. Such conditions, whether they are appreciated or not, mean expensive mining. Advantage can be taken of past experience to reduce the cost of exploitation. If methods which have proved successful in one mine are employed in another the chance is that they will be unsuccessful because they are not adapted to the dissimilar



Fig. 3.

conditions of the second mine. Accordingly the owner is loath to apply to a new mine methods which have proved successful elsewhere, and is inclined instead to try new methods which may miss the mark as widely as those already in use.—L. C. Graton, U. S. Geol. Survey.

A Simple Solution Meter.

Written for the MINING AND SCIENTIFIC PRESS
By E. H. NUTTER.

In the operation of cyanide plants, it is nearly always important to have a means of correctly determining the amount of gold-bearing solution entering the precipitating boxes. In some plants this is done by alternately filling and discharging sump-vats of fairly good size, and recording the height of solution each time a sump is filled. This is a clumsy, though accurate enough, method, but has the objection that it requires nearly constant attendance. Various water meters are manufactured which can be used for solution work, except that those of sufficient capacity are expensive, and are open to the objection that the lime which is used in practically all cyanide-plant solutions, soon deposits a scale in the working parts of the meters, which renders them inaccurate or puts them out of business altogether.

To meet these objections I adapted the familiar sampling box illustrated herewith, to the requirements of the case, and one was installed as a meter at the Liberty Bell mill. The device is simple and cheap, and as others may find it useful, a description of it is not out of place.

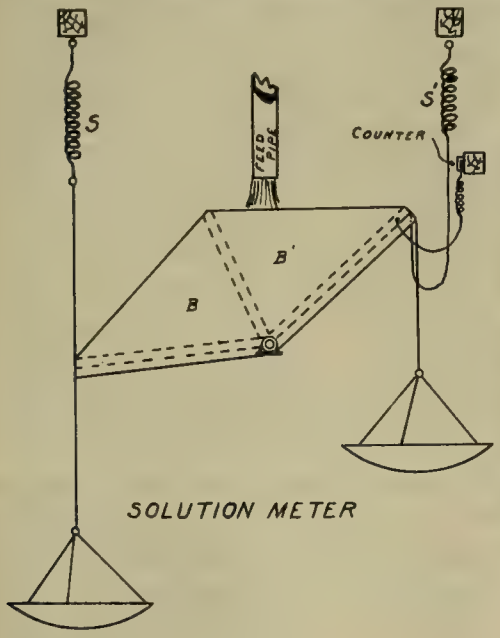


Fig. 1.

The arrangement can be seen by reference to Fig. 1. (Fig. 2 is a view of the meter as installed.) The compartments *B B'* alternately take the solution flow from the feed-pipe. As a compartment fills, the weight of solution overbalances the empty compartment and the box turns through a short arc, discharging as it turns, until it is stopped by the springs *S S'*. Each time *B'* discharges the counter registers 1. The meter at the Liberty Bell is set up over a vat, and the pans shown in the diagram are always submerged. Their retarding effect is necessary to avoid excessive jar. A dash-pot would probably do as well, or else the box could be made of metal with a pear-shaped cross-section, and hung close up to its centre of gravity. The latter form would not need the springs or pans.

At the Liberty Bell, the constant of the meter was determined by filling the vat under it and dividing by the number of double discharges registered. In this way leakage, splash, and all other irregular factors are averaged, and determined. The constant so determined was 0.32275 tons for each unit registered. This meter handles the flow from an 80-stamp mill crushing in cyanide solution. For this size of meter the pans should be at least 36 in. diam., and the springs made of not less than ¼-in. rod. A four-inch hole in the bottom of each pan tends to steady its motion through the solution.

DISTRIBUTION OF GOLD.—At the Haile mine in South Carolina the ore values are distributed as follows: The uppermost portion of the deposits, which was worked as placer ground, was rich. Below this surface mantle the values have decreased, as far as known, rather steadily, although pockets of sulphide ore of better than average grade have been encountered, probably most commonly near the boundary of general decomposition. The limit to which economic mining can be carried appears to bear a pretty definite relation to distance from the surface, and that distance is not great and reaches not very far—usually less than 200 ft.—below the limit of complete oxidation. Moreover, thin films and scales of pyrite and of free gold have been found in joint cracks which give every appearance of having been formed since the silicification of the rock and the attendant ore deposition.

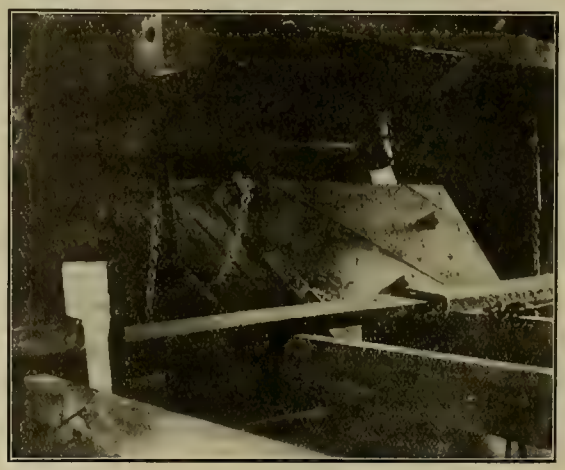


Fig. 2. A Solution Meter.

Thin films of free gold are commonly found on molybdenite associated with heavy pyrite bands. Finally, it is certain that the comparatively plentiful gold which was found at the surface of these deposits and which was derived from higher portions of the deposits now eroded away has remained in that place undisturbed for a long period—in fact, ever since the peneplanation of the region, which probably took place as early as Tertiary time. Erosion at these places has been almost at a standstill and the process of secondary enrichment of the deposits, slow as it is, has had time to be effective. The writer does not undertake to say that secondary enrichment has had much to do with the vertical distribution of the gold, but it certainly seems possible that it has. If such a process has gone on, the action has differed from that common in copper deposits, inasmuch as the copper is derived largely from the upper portion of the deposit *in situ*, while the gold is supposed to have been dissolved mainly from gold which rested upon what was then the surface of the deposits and which had been previously concentrated by mechanical means virtually as placers. L. C. Graton, U. S. Geological Survey.

THERE appears to be some natural law governing the proportions of uranium and radium in rock samples, inasmuch as when the percentage of uranium is known, the amount of radium can be predicted with certainty.

Zinc Resources of British Columbia.

A comprehensive report by the Commission appointed to investigate the zinc resources of British Columbia and the conditions affecting their exploitation has just been issued by the Mines Branch of the Canadian Department of the Interior. The Commission, which was appointed as a result of petitions from the Silver-Lead Association and Associated Boards of Trade of British Columbia, consisted of Walter R. Ingalls, editor of *The Engineering & Mining Journal*, New York, as chief, with Philip Argall, of Denver, Colo., and A. C. Gardé, of Nelson, B. C., as his associates. They had the assistance of A. E. Barlow and Joseph Keele, of the Dominion Geological Survey, who were detailed to investigate the undeveloped zinc ore deposits. The result of their labor is a volume of 399 pages, giving full details concerning the zinc mines and deposits of British Columbia and the processes of production, in addition to much general information concerning the zinc industry and others with which it is associated. The volume contains a large number of excellent maps and illustrations.

The beginning of the zinc industry of British Columbia was practically contemporaneous with its origin in Colorado, the first shipments having been made in 1899. These were chiefly from the Lucky Jim mine near Sandon. A period of inactivity followed, but in 1902 the Lanyon Zinc Co. of Iola, Kansas, began purchasing freely, and other smelters shortly afterward furnished a market. Mr. Ingalls estimates the shipments for the last three years as follows: 1903, 2,567 tons; 1904, 2,828 tons; 1905, 8,561 tons. According to W. F. Robertson, Provincial Mineralogist, the production of zinc ore in 1905 was 11,623 tons. The report of the Commission says that the actual production for that year was possibly 3,000 to 4,000 tons more than the shipments, but this is largely ore held for treatment by magnetic separation, so as to enrich the grade in zinc, which will correspondingly reduce the weight.

The zinc ore hitherto produced in British Columbia has been marketed chiefly in the United States, the smelters at Pueblo, Colorado, and at several points in Kansas, having been the principal buyers. A comparatively small quantity has been exported to Europe. Since the end of November, 1905, a smelter at Frank in Alberta has been in the market. All the ore sent out of the Province in 1905 went to the United States. The ore produced has been blende. No calamine has been shipped and the existence of any important supply of this class of ore has not been reported. The blende has been shipped partly as hand-sorted lump ore comprising the higher grade in zinc, and partly as mill-concentrate. The grade of the latter is reduced by the intermixture of siderite (spathic iron ore) and pyrites (pyrite and pyrrhotite), which occur commonly with the blende of the Slocan and cannot be satisfactorily separated by ordinary mechanical concentration. The blende of the Slocan is 'black jack' and generally of bright lustre, but it is not high in iron.

There are some mines in the West Kootenay that are essentially zinc mines, the best examples being the Lucky Jim and Blue Bell. In each case these were worked originally as silver-lead mines with results that were not encouraging. The proportion of galena to the remainder of the ore was small and it was poor in silver. The Lucky Jim has recently produced upward of 5,000 tons of zinc-blende, assaying 50% or more in zinc, broken to a considerable extent from solid bodies of the mineral and shipped in lump form without cutting. The Blue Bell also shows rich faces of blende ore, which, although mostly of a concentrating grade, will afford a large proportion that selected by hand-sorting is of comparatively high grade. The majority of the West Kootenay mines, however, are essentially silver-lead mines in which zinc-blende occurs as a by-product. In this respect they are similar to many other mines in the Rocky Mountains in which zinc-blende occurs in association with galena, pyrite, and other argentiferous and auriferous minerals. The increased demand for zinc ore during the last few years, which is likely to continue, has made zinc a valuable by-product. While comparatively few of the Slocan mines can be worked profitably as zinc mines, there are many that are worked for silver-lead ore, such as the Slocan Star, in which the zinc ore will be an important item. The yield of silver-lead ore will always be the dominating factor in the operation of these mines.

The method of developing the mines of the Slocan has been such that at the present time there is comparatively little ore that can be estimated as blocked out. The lack of development, and the irregularity of the orebodies, render it difficult to formulate any reliable estimate of their zinc-producing capacity. A calculation based on the production of lead ore in the Slocan during the nine years from 1895 to 1903, indicates the possible production of 30,000 tons of blende per annum provided all the zinkiferous ore were concentrated. This is obviously an improbable result and all things considered, Mr. Ingalls regards 15,000 tons of zinc ore of 50% grade as a liberal estimate for the productive capacity of the Slocan. Mr. Argall considers that the mines of Ainsworth camp can, from present developments, produce about 54 tons daily of zinc ore of 50% grade and might be able to attain an output of 100 tons daily of 45 to 50% stuff in a year or two, if the deposits were mined and milled on a scale commensurate with their magnitude. This estimate is liberal. The conclusion is that the tonnage of ore to be expected is too small to warrant the erection of independent zinc-enrichment plants at the several mines.

The possibility of enriching the zinc ores by magnetic separation, says the report, has been thoroughly demonstrated by the tests conducted by the Commission. The ore tested was of wide variety, representing all the classes now produced in the British Columbia mines. In every case it had been possible to produce a zinc concentrate assaying upward of 40% zinc, in many cases a concentrate assaying about 50% zinc and in a few cases as high as 57% zinc.

These results compare favorably with those attained by the concentration of similar ores in the United States, Australia, and Europe. It must be remembered, however, that a good technical result is not necessarily a good commercial result, owing to the remoteness of the Province and the long railway carriage to markets. Ore assaying only 40% zinc, unless it also contains important silver value, will not be a profitable product in British Columbia on the basis of 5c. spelter. With the exception of a few specially difficult ores, the tests made by the Commission showed remarkably high percentages of extraction, rising in one case to nearly 99% and being upward of 90% in many cases.

The productive districts are fairly well served with transport facilites by existing railway lines. The Canadian Pacific and Great Northern railroads combined with the splendid system of water transportation provided in the Arrow, Slocan, and Kootenay lakes afford good communication through all the districts. The most serious feature is the cost of carriage from the mine to railway or lake, because of the position of many mines on steep mountain sides, in many cases remote. This condition is a bar to the working of many properties.

The Development of the Metal Mining Industry in the Western States.

By WALDEMAR LINDGREN.

*The development of metal mining in the Western States is really a story of the gold and silver mining of the United States, worthy of the genius of a historian; it is a magnificent drama of human endeavor, full of romance and tragedy, of pathos, and even of humor; a story of the valiant struggle of a race of pioneers to conquer the wilderness. And this drama has been enacted in a worthy and ever changing setting; from the vine-clad foothills of the Sierras it reaches to the sagebrush plains of Nevada and to the crests of the Rockies; from the tundras of Cape Nome it extends to the forests of the Cœur d'Alene and to Arizona deserts, where the mirage plays with purple mountain ranges.

The most wonderful feature of this drama is that the main part of it has been enacted within the memory and experience of men now living — within the short space of fifty-eight years. There was a prelude to it, however; where the northernmost waves of Spanish civilization broke against the ranges of New Mexico, dim records exist of gold, silver, and copper mining as far back as the seventeenth century. And much more recently — in 1828, and following years — gold was washed by New Mexican placer miners in the Ortiz and San Pedro mountains almost simultaneously with the beginning of the gold mining industry of Georgia and the Carolinas.

Western metal mining began with the application of the easiest of metallurgical processes, that of washing gold from gravel. This first epoch — that of placer mining — was initiated when Marshall discovered the yellow nuggets in his millrace at Coloma, Eldorado county, California, early in 1848. The first decade was pretty fully occupied by gulch and river mining. In the second decade two important methods of mining were developed. By hydraulicking, carried on in California on a scale never equaled elsewhere, whole mountains were washed away while gold to the amount of a few cents per cubic yard was saved at a profit. By drift mining, the gold stored in the bedrock channels of the old Tertiary rivers was extracted by means of long tunnels in the gravel under a lava cap. Both methods are of course still practised and, transplanted by California miners, they flourish in other States, but their glory began to wane toward the end of the seventies.

Up to 1859 the gold production had been chiefly confined to California, but the following decade witnessed the first attack on the wilderness between California and Oregon. Brave bands of prospectors opened a score of new goldfields. This was the time of Auburn and Canyon City in Oregon; Florence, Elk City, Warren, Oro Fino, and the Boise Basin in Idaho; Alder Gulch, Confederate Gulch, and Last Chance in Montana; Clear Creek and California Gulch in Colorado. All of these placer camps flourished in the early sixties, but excepting the Boise Basin, most of them were shortlived, and were eventually turned over to the patient Chinamen.

The waning of placer mining was marked by a decrease of gold production from $60,000,000 in the early fifties to a minimum of $30,000,000 about 1883. Of a second epoch of placer mining I shall speak later.

The working of gold-quartz followed closely on the heels of placer mining, but here arose an entirely different and much more complicated problem, which first the talent of the Southern Appalachians, then that of Europe, was called upon to solve. Mistakes were many and grevious; the ores below the water-level proved a special stumbling block, and it was not until from 1870 to 1880 that the industry was placed upon a firm footing. In California this was accomplished by breaking from European practice and the invention of the heavy iron-stemmed stamp, the broad amalgamation table and the vanner, and lastly by the application of Plattner's chlorination process to the product of the concentrator. In Gilpin county, Colorada, slightly different processes were adopted. Few of the early placer districts proved rich in gold-quartz veins; this industry, though important, failed to prevent the gradual decline of the gold production. But men were now available who understood the simpler problems of mining and milling.

The exploration of the wilderness in the sixties was rewarded by the discovery of thousands of deposits, from Montana to Arizona. But most of them were not of the familiar type of gold-quartz veins. They contained strange minerals, black or brown masses that turned to silver in the forge, glittering galena, golden chalcopyrite, and deceptive blackjack — some of them unknown and most of them worthless to the pioneer far from lines of communication. The silver ores seemed most promising; to these the miner turned his attention, and so began the third great epoch — that of silver mining.

This new industry was born in Nevada about 1860, though it did not reach its maximum until many years later. Tuscarora, Austin, Bodie, and, greatest of all, Virginia City, what memories do not these names bring back to the old miner? To the north, in Idaho, flourished the Owyhee mines, the Custer and the Atlanta districts; to the south many a camp in the Mohave desert and in Arizona. Confronted by new conditions, the engineer was forced to develop new processes. It is impossible to over-estimate the importance of the Comstock as a school for mining — really the first characteristically American school in the West. Timbering by square sets, to remove large and rich orebodies, modern hoisting and pumping engines, deep sinking, the fight against the subterranean heat, all these made the Comstock a Mecca for mining men thirsting for knowledge. Another important step forward taken about this time was the substitution of dynamite for the ordinary black powder, and power-machines for hand-drilling. The pan amalgamation process — with or without roasting — and the roasting and leaching process, if not new in principle, were developed to suit local conditions.

From the palmy days of Nevada in the seventies, silver milling steadily declined until at the present time one rarely hears the dull roar of the mullers in the iron pans. But in spite of the enormous production of the Comstock, it was not the silver milling of dry ores that glutted the market; it was the stream of the white metal pouring from the smelting works. In historic Gilpin county the smelting industry started in 1868, modestly enough in its beginning, and giving little evidence of the gigantic proportions it was to assume some thirty years later. It was found that the despised sulphide ores contained copper and lead which could be made useful in collecting the silver and the gold, not only in these, but in rebellious dry ores. Our teachers in copper smelting were Welshmen and Cornishmen, while Germans instructed us in the reduction of the lead ores. In the seventies several smelters were operating in Colorado, and the silver-lead mines at Eureka, Nevada, were producing richly. Soon Montana and Arizona established smelters, and from that time to the present day the history of smelting is one of almost continuous progress, during which our European teachers eventually were left behind.

About 1875 the Leadville smelting ores were discovered above the placers of California Gulch and the silver production of Colorado doubled in a year. Aspen soon

*A paper read before the American Mining Congress, at Denver.

added its masses of argentiferous lead. Idaho contributed heavily from the rich smelting ore of the Wood River district. Treasure poured in from Park City, Utah. Steadily the silver output rose and equally steadily the price sank. The maximum of production of 63,600,000 oz. was attained in 1892; since then the annual yield has averaged 55,000,000 oz., but the decline in price was not checked until ten years later, when the record read 47 cents. Nearly one-half of our present output is a by-product obtained from smelting of low-grade copper and lead ores.

The last chapter of the remarkable story of silver is familiar to us. Rapidly rising, the price has attained 70 cents, a fact which may seem surprising, but indeed is really only the logical outcome of lately prevailing conditions. The mines will respond to the demand — their ability to do so is scarcely to be doubted — and we may stand at the beginning of a second epoch of silver mining.

Let us now, just for comparison, glance back at the condition of the western country about 1883; California, yielding a decreasing amount of gold, was still the proud leader. Nevada's smelters and mills were decaying. Arizona produced a fair amount of silver from the Tombstone, Silver King, and other districts, but the copper industry was in its veriest infancy at Globe, Clifton, and Bisbee, while United Verde was unknown. Colorado was going strong in silver and lead. True, its gold production was small, but it was bravely held by old Gilpin county. Cripple Creek was a cattle pasture. In the San Juan country, only discovered a decade earlier, some silver was laboriously and expensively produced, with gold as a by-product. Utah had its Park City, Horn Silver mine, and Tintic, but who dreamed of a great copper industry to rise in the dull camp of Bingham? The Mercur ores lay unheeded underneath their blanket of limestone. In Montana, much silver mining was going on. The lead smelters were active and some silver-gold mills were in operation. The first Anaconda smelter, with its wasteful concentration and its rows of Welch reverberatories, was planned; the possibility of Butte turning into an important copper camp was seriously discussed. In Idaho, prospectors were just trenching the Cœur d'Alene outcrops after the wild mid-winter rush to the Murray goldfield. As to Alaska, that Territory slumbered through Arctic storms and midnight sunshine; nobody suspected what would happen on Douglas island, at Cape Nome, or on the Tanana, twenty years later.

The world woke up one morning in the early eighties and found itself decidedly short of gold; as many know, this is a disagreeable feeling. The United States had barely produced thirty million dollars in the last year. The search for gold proved easier than expected. In the last decade of the past century the production rose rapidly; from 1893 to 1900 it more than doubled.

This condition of affairs was partly due to the engineers, but largely to the prospectors. The early nineties saw some wonderful technical improvements. First among them is the cyanide process, the practical application of an old, half-forgotten fact that gold is soluble in cyanide of potassium. Its importance cannot be overstated. Developing rapidly, it is today an art in itself, providing a cheap method for the reduction of many precious-metal ores formerly only partially tractable to pan amalgamation. But most important of all, it provided ready means of extracting the gold from the tailing of the amalgamation and concentrating mills, intractable masses which had piled up in reproachful heaps or guiltily escaped down stream. The perfection of the barrel-chlorination process also belongs to this epoch.

About this time electricity came upon the scene. Pumps and hoists and mills could now be driven at reasonable cost from distant waterfalls or coalfields. Mining methods improved and new ways of extracting great orebodies — such as the filling and caving systems — often replaced the expensive square sets. The invention of the small drills for stoping was another step forward. When steam was used, compound engines replaced wasteful single cylinders. The catalogue of improvements could be easily extended. As a consequence, hundreds of deposits abandoned by the early miners at water-level were re-opened and made productive.

But all this technical progress would not have doubled the production. The second factor was the prospector, who succeeded in demonstrating the fallacy of the belief that all the gold deposits of this country were known. In Cripple Creek, at Creede, in the Black Hills, and in the many recently discovered rich districts of Nevada, we see the results of his work.

The third factor is what may be called the revival of placer mining. Since 1897 the old scenes of 1849 have been re-enacted with modern modifications in Alaska, raising the placer production of the Territory to about $12,000,000 in 1905. New conditions led to new inventions — among them the mining of frozen ground by steam. Nor can it be said with assurance that the epoch of discovery in Alaska is past; that frosty Territory may have further surprises in store for us. Meanwhile the gold dredge began to add to the production of the old diggings in California and elsewhere. In 1904, California produced $2,000,000 from this source. Nevertheless, the dredge and the dredging deposits have their limitations, and the yield from this source is not beyond calculation.

From 1900 to 1904 gold production remained stationary, except for a decided decline in 1903. But 1905 saw a sharp increase to about eighty-seven million dollars, and it is more than probable that the present year will surpass this record. Will the gold production reach the hundred million mark? Who can say it will not, while the pioneers are still exploring Alaska and while the gold camps are multiplying in Nevada? But one fact that should be borne in mind by the enthusiasts who predict a flood of gold is that the heavy increases do not, as a rule, come from the old camps, but from the new discoveries. New orebodies will always be opened, but new camps will not always be discovered at the recent rate.

The interests of good mining are not always served by the finding of rich ore. True progress in the art is more apt to be recorded at the low-grade mines, especially those containing copper and lead, where small economies may make the difference between profit and loss, and so it comes that the best practice and the most modern inventions may be found at our base-metal mines.

Previous to 1880 the West yielded less than a fifth of our total copper production — small as it was — and that fifth was really only smelted for its property of collecting gold and silver. The copper production of the Western States had grown from 5,000 tons in 1880 to about 300,000 tons in 1906, and it has doubled since 1893. A flood of copper is coming from Arizona and Montana, and in its production all the resources of modern mining and smelting are employed. Compare, if you will, the concentration mills and giant blast-furnaces, the converting plants, the electrolytic refineries, in short, the industry based on a 2 or 3% ore with the laborious roasting, smelting, re-smelting, and refining of the 15% ore of twenty years ago. The leaching of copper ores, of which much was expected, remains a subordinate process. The world's appetite for copper is growing at a rate difficult for the

producer to follow. In spite of the incentive of sensational increases in price, the present outlook is not favorable for an increase of production at the rate of the last ten years. The copper industry still maintains a healthy independence, the output being scattered among a large number of producers. The western industry centres in Arizona and Montana, but Utah, Alaska, and California may soon become their rivals.

The lead industry, whose Western centres are situated in Colorado, Utah, and Idaho, has progressed in a similar way. In 1880 only about 80,000 tons of lead was contributed by the West; in 1904 the amount had grown to 220,000 tons, but the production has failed to advance at the same rate as the copper output.

Less conspicuous are also the improvements in mining and smelting. It may be doubted whether the lead resources of the Western States are equal to keep the task of maintaining the present rate of increase, although the price of lead has recently left its time-honored position at four cents per pound and moved up near six. The most notable event in this industry is its recent consolidation into the hands of one strong corporation, which practically controls the output and the price.

The year 1903 witnessed the beginning of the zinc mining industry in the Cordilleran States, and in three years the once anathemized zinc ores were turned into an unexpected source of revenue. It is not difficult to predict a wonderful future for this industry, the technique of which is yet in its infancy. Chief among the problems is the separation of zinc-blende from pyrite and chalcopyrite; this will perhaps be effected by the new electro-magnetic and electro-static machines. Another problem is the utilization of the precious metals contained in the zinc ores. At present they are often wasted. Colorado is the largest producer of zinc ores, chiefly from Leadville, but also from Aspen, Creede, and Clear Creek. The output from New Mexico and Utah is also increasing rapidly.

A monopoly in mining is fortunately a condition that seems very far from us. But there exists unquestionably a tendency in the smelting and reduction industries toward concentration in a few hands. Doubtless this is attended by some advantages to the miner in the way of a ready market for his ore, and often also in a diminution of reduction costs due to operation on a large scale, but this dependence upon large concerns also carries with it certain disadvantages. One point relating to the marketing of ores may be emphasized. The miner of complex ores is apt to sell his ore—containing copper, lead, silver, or gold—like so much coal at so much per ton as per smelting schedule, and at the end of the year he is totally in the dark as to how much of each metal his ore contained, how much he got paid for, what he failed to obtain pay for, what he could have saved by changing his mining practices in certain ways. This unfortunate habit prevails in a most astonishing degree today in Colorado, and that not only among the small producers, but among many large companies.

We would be ungrateful not to recognize our debt to Europe, Germany, and England above others, for guiding the first steps of our metal industry. We owe much to them, even if their advice, because of a radically differing situation, sometimes resulted in failure. But we should recognize with pride that in the face of many discouragements we have worked out our problems in an independent spirit and always with consideration of actual conditions rather than of authority and pattern. It is this quality, as well as their enterprise and energy, that has placed American mining engineers at the head of their profession. It should be emphasized that it is largely the American mining schools in their rapid development of the last twenty years that have supplied the material for the profession. Young men now come out of these schools with an adequate foundation of elementary knowledge upon which practice can rear a safe structure.

To look backward upon the magnificent achievements of the past is useful only as an incentive for further steps in advance. That such steps are being taken every day of the year in every State of the West is a fact with which all of us are familiar. In Colorado, Utah, Montana, Nevada, and California, mining is at a high tide, and the best promise lies in the fact that so many new mines and districts are coming to the front. We know that the West can produce more silver, perhaps it can produce more gold, possibly more copper and lead. But shall we be able to maintain the terrific pace set? And to this the Western Spirit, in calm confidence, answers that it can try. It has already accomplished things once thought impossible.

IDENTIFICATION OF STREAM TIN.—Let us suppose the prospector in the act of panning off a dish of gravel. He has thrown out the larger pebbles, and the material remaining in the pan is clean washed gravel. Perhaps as his washing continues, and he rids the pan of the bulk of the lighter sand, he may find in the diminishing residue a number of pretty stones, crystals of different colors and of varying transparency. These may be crystals of topaz, garnet, zircon, tourmaline, or sapphire, and if the prospector has any skill in applying the test for hardness he will be able to identify these crystals fairly well. If he is a judge of their other properties, so much the better; he can then make confirmatory tests. The sapphire will scratch a topaz, and they will both scratch a quartz crystal—the sapphire, quite easily, and the topaz less so. The other crystals will also scratch quartz if a sharp edge or point is used with a fairly heavy pressure. The presence in the pan of the above minerals is a good indication of the possible presence of stream tin. As the panning off continues, black sand will perhaps begin to appear. This black sand may consist of magnetite, ilmenite, wolframite, tourmaline, or of stream tin alone, or associated with any or all of these minerals, some of them perhaps in the state of fine sand, and some in pieces large enough to be easily picked out with the fingers. When the operator has reduced the material in his pan to a good concentrate clear of the lighter sand, the pan should be held over a fire and the contents dried. Then if a magnet will not attract any of the particles, he knows there is no magnetic iron present. If the larger pieces which may remain in the pan show no disposition to be easily separated from the fine they should be picked out and laid aside until some way can be found of testing them. If they are not attracted by the magnet, they are likely to be either tin or wolframite, but the latter mineral may easily be scratched by a quartz crystal. Stream tin varies in size. It may be found from the state of fine sand up to pieces of several pounds weight. It also occurs in many colors, the more common being black, brown, red, and yellow. A sapphire will easily scratch the smooth surface of a pebble or crystal of tin oxide, but a quartz crystal will only make a scratch when a heavy pressure is applied. Tin ore may, owing to its heaviness, be easily separated by panning from almost any other mineral. Where stream tin occurs it may be panned off in quantities varying from a few grains to as high as several pounds weight to the pan, according to the richness of the gravel. With a good body of tin-bearing gravel and facilities for economic working an average prospect of an ounce or less to the pan would give large profits.—Charles F. Walker.

Two Interesting Reports.

The Oriental Consolidated Mining Company, working in the Wunsan district of Korea, issues its reports for the year ending June 30, 1906. The operating profit was $367,882, and after putting back $140,637 into new construction, development, etc., there remains a net profit of $227,245. The after-effects of the Russo-Japanese war hindered production, so that 21,230 tons less were milled than in the previous year. The total output was 236,417 tons, containing $1,197,637, or at the rate of $5.065 per ton. To mine this ore it cost $1.14 per ton, inclusive of all underground development. In the mills the total extraction averaged $3.89 per ton, a net saving of 76.8%. Of this, $2.30 was secured as bullion and $1.59 from the concentrate.

The cost of milling was 62½ cents per ton. Cordwood accounts for 6¼ cents. For an average of 266 days, 220 stamps were in operation, crushing 236,417 tons or 4 tons per stamp per day; 19,363 tons of concentrate were separated. The tailing averaged 79½c. per ton. An experimental plant for re-grinding the coarse concentrate was built. This was described in our issue of September 22. The two cyanide plants treated 31,611 tons with an average extraction of 64.6%. On fresh concentrate the extraction was 75.4%, on dump stuff it was as low as 32%. A profit of $7,793 was made by re-treating the old cyanide dump.



The Dolores Mill, Chihuahua, Mexico.

In order to test the gravel deposits included within the concession, a Keystone traction drill was employed and 67 holes were put down. The average yield was 6 cents per yard, that is, it proved too low-grade to be dredged. In another locality the occurrence of a narrow channel about one mile long, averaging 12 cents per yard, was ascertained. The gravel deposits on the concession that may possibly be worth dredging consist of 40 or 50 miles of river valleys, varying in width from a few hundred feet to a mile. Evidently a great deal of testing is required.

The report gives an interesting list of the cost of supplies, of general expenses, of construction expenditure, of milling costs, and a great amount of useful information, not only to shareholders but to the mining profession. It is to be credited to H. F. Meserve, the general manager.

The Dolores Mines Co. issues an annual statement covering the business up to September 30, 1906. It is accompanied by the report of Mr. John B. Farish, until recently consulting engineer to this company. The early history of the undertaking is related, stress being laid on the inadequacy of the working capital. It appears that the promoters were in a dilemma; in order to make a successful flotation, it was necessary to maintain a certain parity between the net value of the ore and the total capitalization; to increase the working capital would have destroyed this uncertain equilibrium, therefore the company started with a fund of $145,000, which proved totally insufficient. The mine is in the Sierra Madre mountains of western Chihuahua, Mexico. It is difficult of access, being a hundred miles from the nearest railroad. Communication and transport are effected over a rough mule-trail. All supplies and machinery must be broken in packages of from 150 to 300 lb. each. During the construction of the mill $25 was paid for packing a cam-shaft weighing 485 lb., while $37.50 was paid on a piece of a Cameron pump weighing 630 lb. Owing to the scarcity of mules and the needs of neighboring mine operators, the rates of transport have since been advanced 25 to 30 per cent. The average time for a mule-train to the mine is 10 to 12 days, the journey back without a load requiring 5 to 6 days; the animals need an interval of rest, bad weather makes travel slow, and often stops it for weeks. These facts are worthy of emphasis in connection with the time and money required to equip the mine and put it on a productive basis.

Soon after the property was taken over it was found that the streams near the mill could not furnish enough water during the dry season, therefore a water-right was secured three miles distant and a pump was erected. Mr. Farish speaks of this piece of engineering with proper pride: "This pump is the finest piece of sectionalized machinery of the sort that I have ever seen. It has a capacity of 100,000 gal. daily, pumping through 6,000 ft. of pipe against a head of 1,450 ft. Such conditions impose a severe test on the pumping plant, but this has been met by a Riedler pumping-engine. The plunger of this pump is differential, having 2$^{3}/_{16}$ and 3$^{1}/_{16}$-in. bore with 28-in. stroke, actuated by a Corliss condensing-engine. The ease with which it works and the fact that is a sectionalized machine, surprises all who see it. The tank into which the water is thrown by the pump through 3,000 ft. of 3 in. and 3,000 ft. of 3½-in. pipe, is of solid masonry. From this intermediate tank it flows by gravity through 10,000 ft. of 4-in. pipe to a second tank, also of solid masonry, located on a hill above the mill, and having a capacity of 200,000 gal. The building of these tanks in a country where there is practically no lime was an expensive item."

The report proceeds to give valuable information concerning timber and fuel, mules and pasture, and labor conditions. In regard to the last, it appears that Col. W. C. Greene tried to secure laborers and to do so he increased wages 25%, disturbing the operating costs of all his neighbors—as neighbors go in the Sierra Madre, where the matter of a few miles does not count.

The mill is illustrated herewith. It does credit to Mr. J. Gordon Hardy, the late manager. Rock-breakers deliver to three batteries of five stamps each that crush 60 tons per day through a four-mesh screen. They deliver to three Bryan mills for preliminary re-grinding. Then comes a Gates tube-mill, which slimes the ore to 200-mesh. The capacity is 35 tons per 24 hours and even this is lessened by interruptions, so that the results have

been disappointing. It is proposed to erect another tube-mill and to use the pans, of which there are four, as a reserve, for fine grinding. The pans were used for a long time for direct amalgamation, in association with two settlers. The cyanide plant itself proved a "heat-breaking affair," owing to the difficulty of getting lumber. Four agitation vats of 22 ft. diam. and 15 ft. depth are followed by three decanting vats of the same size, delivering to two settling tanks of 30 ft. diam. It is proposed to use a mechanical Dorr classifier to remedy the present imperfect classification.

The ore is a high-grade product, containing both silver and gold in the ratio of 40.6 to 59.4, taking silver at 65c. per ounce. The 9,793 tons of ore treated have yielded $488,021, leaving $309,066 in the tailing, which is to be



Richard Tangye.

re-treated. There are remaining in the mine and on the dump 30,518 tons valued at $1,431,021. A dump of tailing from amalgamation is estimated to contain 9,500 tons, worth gross $309,055, so that the total reserve of all kinds amounts to 40,018 tons of a gross value of $1,740,087. The net profit on the year's operations is $267,621, but all this has been consumed in meeting sundry payments, in equipment, New York and London expenses, etc., so that the Company still owed $173,374 on June 30. Mr. Farish outlines an additional expenditure on machinery, equipment, and improvements absolutely necessary, of $78,500. Thus $250,000 is needed. When this is done, he considers that the Company can maintain a profit in excess of $20,000 per month, the present earning at the mine.

THE study of the earth indicates the continuation of processes of natural causation for a period of time as great, in relation to human history, as the distance of the heavenly bodies from us are, in relation to terrestrial standards of measurement. The abyss of time looms large as the abyss of space.

Richard Tangye.

We are in receipt of an excellent portrait of Sir Richard Tangye, who died on October 14. By his achievements in mechanical engineering as applied to mining he won a position and a fame that were rendered illustrious by his striking personality. Born 73 years ago in the parish of Illogan, Cornwall, he came of a stock already distinguished by the possession of mechanical ability. As a youth he was first a clerk in an engineering works at Birmingham, the establishment becoming celebrated by reason of the fact that it made the first railroad car for the London & North Western Railway. In 1852 Birmingham had no such educational facilities as it now possesses, but young Tangye, and the two brothers who joined him shortly afterward, made the most of them. The brothers decided to go into business on their own account; Joseph Tangye designed a lathe; and in a room that was rented for four shillings per week and into which a revolving shaft projected, there was laid the foundation of a great engineering works. The Crimean war came, a schoolfellow was under contract with the Government to supply lint, and he wanted a machine that could do it rapidly and well. The Tangye brothers constructed one which served the purpose and thus they made their first step forward. But their great opportunity came when the *Great Eastern* was built. Sir Richard Tangye often remarked: "We launched the *Great Eastern*, and she launched us." The great Brunel had seen their hydraulic press for covering safety fuse with gutta-percha and when the monster white elephant of the seas was about to be launched, he remembered this fact, for everyone supposed that it would be necessary to moderate, not to accelerate, the descent of the big vessel into the water. Brunel's agent surprised them with a visit in 1856 and brought several of the machines, thinking that they would be of service in sending the *Great Eastern* down the slips. But the launching proved far otherwise; it became necessary to help the descent of the vessel, and it took three months to do it. A large order for jacks was placed with the Tangyes and their finances were put on a healthy basis. Then they moved to larger premises and secured independent motive power by the purchase of an old engine and boiler. They were joined by another brother who returned from America and soon afterward they engaged their first workman. The latter is still with the firm. They made a practical success of the differential pulley-block, got into a lawsuit and won it. In 1866 a warehouse was opened in London. Branch offices were established at Newcastle, Manchester, and Glasgow, and thus the business of the firm grew until it ramified into every quarter of the globe. In 1896 Richard Tangye was knighted in recognition of "services rendered to art education in Birmingham," but the reason for the honor lay deeper; it was due to the energetic man who had created a new branch of commerce founded on the mechanical arts, to the generous employer who was ever mindful of the best interests of those he employed, and to the public-spirited citizen who knew how to face poverty with courage and to wear riches without ostentation.

A NEW PROCESS of making quartz-glass in much larger quantities than has hitherto been possible has been discovered by the employment of high temperatures and pressures. In a quartz-glass vessel, gold, copper, or silver may be melted or even vaporized without injuring the receptacle. Quartz-glass expands scarcely at all; hence cold water will not break it, if poured over it even while hot. It transmits freely the ultra-violet rays of light, to which ordinary glass is almost opaque.

Diamond Mines in South Africa.

*Volcanic pipes in which diamonds are found are not peculiar to South Africa; similar formations have been discovered in New Zealand and quite recently in Connecticut; but it is only in South Africa that the diamond deposits have attained any economic importance. The so-called pipes in which the diamonds are found may be considered to be the material filling the craters of extinct mud volcanoes; this is not a very scientific description, but it will perhaps give, in a few words, an idea of the nature of the deposits.

For a long time it was supposed that diamond mines were only to be found in the neighborhood of Kimberley and in the district further to the east in the Orange River Colony, where the Jagersfontein and Koffyfontein pipes are situated. Within the last few years, however, diamond pipes have been found in many other parts of the country, and among them may be mentioned the Premier, Montrose, and Schuller pipes near Pretoria, in the Transvaal; the Lace and New Randfontein Reef pipes, near Kroonstad; and the Victor pipe, near Boshof, in the Orange River Colony; while the Peizer, New Weltevrede, and Frank Smith have been discovered to the northwest of Kimberley.

The price of diamonds has been controlled for some years by a powerful combination of diamond merchants in London; no difficulty has been found in maintaining the price, and since the Boer war, more particularly, the value per carat has been steadily rising. The question as to the possibility of keeping up the price of diamonds with a largely increased supply in prospect is one that is frequently asked, and leading authorities are agreed that at least twice the present annual supply could be absorbed without affecting the price per carat. It is considered, however, that as regards only the better class stones there will always be a demand. The value per carat of the diamonds recovered from the principal producing mines according to their latest report ranges from 23s. at the Premier to 69s. at the Dutoitspan. These figures are merely averages, and do not imply that there are no good stones found in the Premier mine or no poor ones at Dutoitspan. Every mine produces a certain amount of rubbish, worth about 9s. per carat, and the percentage of these poor stones found determines the average value of the yield. Thus at the last Premier meeting one of the directors pointed out that 75% of the total money value produced was represented by diamonds worth 52s. 6d. per carat, and the balance of 25% was made up of diamonds worth 9s. per carat.

Similar variations in value occur in the stones found in all diamond mines. As showing the gradual increase in the value per carat during the last twenty years, the following figures taken from the report of the New Jagersfontein mine may be of interest:

Year.	Average price realized per carat.	Year.	Average price realized per carat.
1887	28s. 4d.	1899	34s. 6.3d.
1891	37s. 2.3d.	1903	54s. 2.6d.
1895	31s. 1.0d.	1905	57s. 9.9d.

Since the issue of the report for 1905 the average price per carat has risen a further 5 per cent.

According to their annual report for 1890, the combined output from the De Beers mines and New Jagersfontein was about 1,550,000 carats, while for the corresponding period ending in 1889 the two companies produced together some 3,130,000 carats. At the outbreak of the Boer war, however, the diamond-mining industry became completely disorganized, and the mines have apparently hardly yet returned to the 1899 rate of production. Thus, according to the latest report of De Beers and New Jagersfontein issued in 1905, it appears that the total number of carats won by these companies for the year was about 2,166,000 carats, or a decrease of 960,000 carats as compared with the figures for 1899. It should be understood that the figures are merely approximate, as it is impossible to find from the De Beers report for 1905 the number of carats actually recovered. As a set-off to the shortage in the output of these older companies, the Premier mine during 1905 won 845,652 carats, so that the total output from South Africa is at present very nearly what it was at the period just before the war. The other South African producers have been of little importance, but there are at least three mines which are expected one day to turn out large quantities of diamonds at a handsome profit. These are the Lace, the Roberts Victor and the New Randfontein Reefs mines. Of these, the Lace mine has already produced over 60,000 carats, is fully equipped with a washing plant, and has some 750,000 loads of blue ground on the floors. It will very shortly enter the regular producing stage, and a grade of from 14 to 20 carats per 100 loads washed is anticipated. The Roberts Victor and the New Randfontein Reefs are little more than prospecting ventures at present. In each case, however, a pipe has been found, and preliminary trials with a small washing plant point to a return of rather over 20 carats to the 100 loads, the average quality of the stones being very satisfactory.

Any estimate of the probable future annual production of diamonds must necessarily be a rough one, but it is apparent that there will be a large increase, even if no further new discoveries are made. By the year 1908, it may be assumed that the new mines discovered will be equipped and will have become regular producers. The probable increase in the output of diamonds for that year compared with the 1905 returns may be estimated as follows:

	Carats.
Premier Diamond Mine	1,200,000
Lace Diamond Mine	80,000
Roberts Victor Mine	100,000
New Randfontein Reefs Mine	200,000
Total increase	1,580,000

The returns from De Beers and Jagersfontein will be assumed to be the same as in 1905 (that is, 2,166,000 carats).

The Premier is by far the largest and most valuable individual diamond mine ever found in South Africa, and it is probably not an exaggeration to say that it is one of the most valuable mines of any kind ever discovered in the world. It is estimated that when its full plant is at work, it will make profit at the rate of £2,000,000 per year, the life of the mine on this basis being well over 50 years. Considerable interest will be taken in the attempt which is to be made at the Schuller mine to treat blue ground in tube-mills. The diamondiferous ground at this mine will not decompose when subjected to atmospheric agencies, so that it is necessary to disintegrate it by mechanical means. If crushers or rolls be used for this purpose the diamonds, which are brittle, although extremely hard, are broken as well as the matrix, but in the grinding action which takes place in a tube-mill it is thought that the diamonds will be separated from their enclosing minerals without being fractured. Experiments carried out on a small scale point to the feasibility of this arrangement, and if further experiments prove successful the adoption of tube-mills will revolutionize the treatment of blue ground on diamond mines by doing away with the expensive and tedious process of flooring, which adds both to the cost and the capital expenditure.

According to the new Transvaal diamond law, the Government has a right to take up 60% of the profits of any diamond mines found in the colony, after allowing for all capital expenditure necessary to equip the mine.

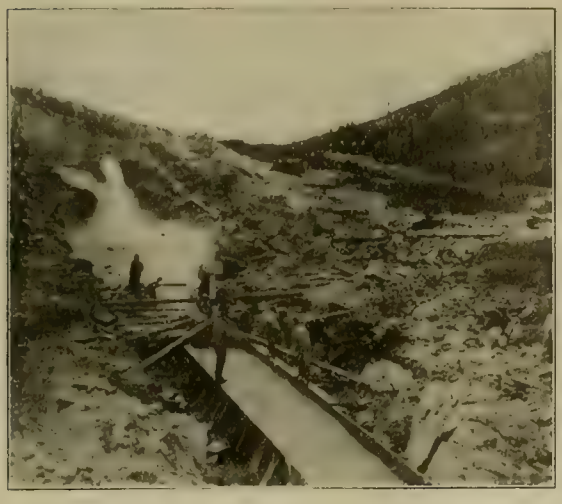
*From *The Times*, London, re-published and abstracted from *South African Mines*.

A New Application of Hydraulicking.

Written for the MINING AND SCIENTIFIC PRESS
By ETIENNE A. RITTER.

In the operation of a hydraulic placer mine it is often found necessary to drive a long cut through solid rock, in order to bring the head of the sluice-box at the lowest point of the bedrock.

This summer it was found necessary to make a cut of this nature at the Bear mine, in the Cariboo mining district, British Columbia. The cut was to be 800 ft. long and 27 ft. deep at the deepest point; it was to be 10 ft. wide at the bottom. The cut had to be driven through partly disintegrated crystalline schist. The schist dipped at 30° toward the upper end of the cut, breaking into layers from a quarter to three inches thick.



Making a Cut for the Sluice-boxes.

Messrs. B. A. Lasalle and John Wendle, who manage the property, decided to use the power of the water from their monitors to make that cut, taking advantage of the dip of the schist and of their stratification to accomplish this work. One No. 6 monitor was set at the low end on stulls six feet above the ground, so as to leave room for the gravel—as it was washed away—to pass below it. Another monitor, No. 2, was used to wash away the schist as it was broken up.

From the elevation of the pen-stock, the water leaves the monitors with a pressure of 80 lb. per sq. in. The work was done in a series of cuts 100 ft. long, both monitors being advanced that distance and set again before starting to make the next cut.

The lower monitor literally lifted the schist, breaking the rock into fragments, while the upper giant was washing it away, offering continuously a new surface to the action of the lower monitor.

The minimum amount of powder was used in blasting and bulldozing, and only as a last resort to straighten the sides of the cut and to square the bottom. The shots were used mainly to loosen the ground so as to give the stream of water from the monitors a chance to be effective.

The 800 ft. of cut were driven between June 14 and August 20, at the rate of 5.88 ft. per shift, in including all the delays, such as the moving of the monitors, the relaying of the pipes, etc. At times, when the cut was already more than 20 ft. deep, the advance reached 8 ft. per shift for a week at a time. One monitor man and two Chinese for bulldozing and for working in the ground-sluice with rock-hooks, were employed on each shift.

The total cost of the work, without putting in the sluice-box, but graded and ready to lay down the sills in place, was $3.30 per running foot. That same cut made by drilling, blasting, and mucking would have cost at least three times as much and taken twice as long.

A SENSITIVE direct reading level, called the Shaftometer, has been brought out by a Halifax company for lining up shafting, machinery, etc. It has a rigid gunmetal base 16 in. long, a glass tube 12 in. long, and a brass scale runs the entire length of the tube on each side, each graduation of about one-eighth of an inch corresponding to a difference in level of one-thousandth of an inch per foot. A table shows at a glance the thickness of packing required to bring a given length of shafting up to level.



Working at Both Ends, Making the Cut.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A mortgage described the real estate as "the mineral land described in said deed," but the deed referred to gave no particular description af land as mineral lands but the court decided that the description in the mortgage would be construed as meaning the lands described in the deed that were in fact mineral lands.

Smith *v.* Vary, (Ala.) 41 South, 941.

The East Itasca Mining Co. was the owner of several lease hold terms of 30 years in properties located in Minnesota upon which it had made explorations for iron ore. The company thereafter assigned certain of the leases to the Cleveland Iron Co. under an agreement by which the iron company was to pay the mining company within six months from the date of the contract seven cents for each ton of ore averaging 56% of iron found and the work was to be conducted with reasonable diligence during a period of six months; the contract lease required the iron company to thoroughly develop the land for the purpose of determining the character and extent of the deposit of iron ore. In an action by the iron company against the mining company to recover an amount alleged to have been paid in mistake the court decided that the contract bound the iron company to pay the mining company seven cents per gross ton for all iron ore discovered or shown to exist by the completed explorations reasonably and fairly made within the specified time and that the contract did not contemplate the estimate of the actual quantity of ore existing within the premises, and it was further decided that explorations reasonably and fairly made based on a customary assumption that a drill-hole would properly disclose the condition of the earth within a radius of 100 ft., but therein subsequently developed that such assumption was erroneous, or other assumed facts on which the exploration was based were false, yet the iron company was not entitled to recover any part of the money paid on the theory that the payment was made by a mistake of fact.

Cleveland Cliffs Iron Co. *v.* Itasca Mining Co., 146 Fed. 232.

A mining lease provided that if any difference should arise between the lessor and the lessee as to any matter relating to the agreement, it should let it be referred to three disinterested persons. But it was decided that this agreement did not apply to a clause in the lease providing for an examination by three mining engineers to determine whether all the coal on the land capable of being mined had been paid for, so that the lease should not thereafter be required to make further payments on account of coal mined.

Henry v. Lehigh Valley Coal Company, (Pa.) 64 Atl. 635.

Where an applicant applies for a patent to a mining claim located by him, the Land Office, in the absence of the filing of an adverse claim, will indulge the presumption that no conflicting claims exist to the premises described in the application, but when an adverse claim is filed such presumption does not arise.

And in a controversy arising out of conflicting claims the court will presume that the location which is prior in time has prima facie the better right and that the burden of rebutting such presumption rests upon the party whose claim is subsequent in point of time. But the party whose claim is subsequent in point of time may show that at the time of the alleged location of the other party's claim the discovered point was located within the limits of an existing and valid location of another party, so that the ground was not at such time subject to location.

Lockhart *v.* Farrell (Utah) 86 Pac. 1077.

The statutes of Minnesota providing for the issuance of mineral leases have been held to be constitutional.

State *v.* Evans, (Minn.) 108 N. W. 958.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The black metallic mineral in quartz from Geiser, Oregon, marked A. G., is Graphite.

The two minerals from Yerington, Nev., marked A. J. T., are No. 1, Limonite; No. 2, specular Hematite.

The two rocks from Kingman, Ariz., marked F. C. S., are: No. 1, Feldspar, porphyry; No. 2, Augite diabase.

Rocks from Villa Grove, Colo., marked K. M. D., are No. 1, 2 and 3, Andesitic rocks, essentially alike; No. 4, Melaconite with malachite; No. 5, Granite.

The rock samples from J. L. H., of Isabella, Cal., are: No. 1, Slate; No. 2, decomposed Granite; No. 3, Gneiss, containing bornite and a little chalcopyrite.

Rocks from Palisade, Nev., marked S. F. P., are: No. 1, decomposed volcanic rock; No. 2, also altered volcanic. The green coloration is due to ferrous iron and not to copper.

Specimens from A. P., of Placerville, Cal., are: No. 1, Talc-schist, containing some manganese di-oxide; No. 2, Hematite; No. 3, brown Limonite; No. 4, earthy Limonite; No. 5, Serpentine; No. 6, Chlorite. There are no indications of tellurides or tungstates.

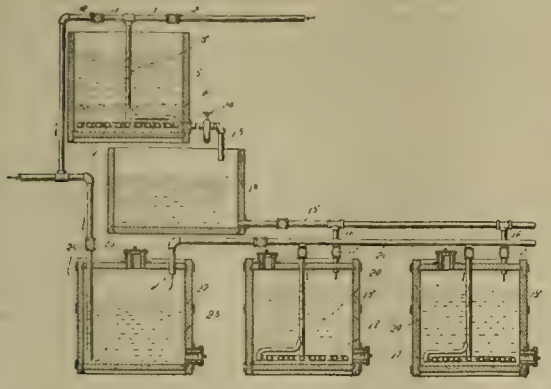
PLATINUM.—The price of ingot platinum per ounce increased from $18.50 in December, 1904, to $34 in September, 1906. In March, 1906, quotations of platinum were about 20% higher. The most promising fields for the production of the metal in the United States are southern Oregon and northern California, but in addition it is found in a number of other Western States and in Alaska, besides which "isolated occurrences of single nuggets or mere traces of the metal have been found" in a few Eastern States. The total production of platinum in the United States in 1905 is reported as 318 oz., valued at $5,320, as compared with 200 oz. valued at $4,160 in 1904. The imports of platinum in the United States during 1905 were valued at $2,173,263, and in 1904 at $1,879,155; 1903, $2,055,933; 1902, $1,987,980; 1901, $1,695,895. It will be understood, of course, that these figures include both nuggets and manufactured products in various forms.—F. W. Horton in *Mineral Resources*.

THE MINERAL OUTPUT OF GREAT BRITAIN.—The Home Office has issued Part III of the Annual Report on the Mines and Quarries in the United Kingdom. It shows that the total value of the minerals raised during the year amounted to £95,870,723, a decrease of £1,606,916 as compared with 1904. This decrease is to be accounted for by a further fall in the average price of coal from 7s. 2.58d. per ton in 1904 to 6s. 11.38d. in 1905. The total output of coal was the highest hitherto recorded, namely, 236,128,936 tons, but the value was only £82,038,553, as against £83,851,784 in 1904 and £88,227,547 in 1903, when the output was less by more than 3½ and 5½ million tons respectively. The amount of coal available for home consumption was 168,968,291 tons, or 3.910 tons per head of the population, and 19,255,555 tons were used in the blast-furnaces for the manufacture of pig-iron, as against 17,535,337 tons in the previous year. Among the smaller items of production there is mention of 14 tons of silver ore, worth £306, and 15,981 tons of gold ore, worth £17,787. In 1904 the output of gold was valued at £68,576.

MINING AND METALLURGICAL PATENTS.

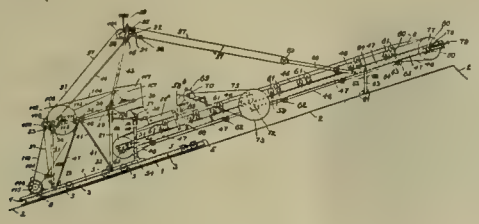
Specially reported for the MINING AND SCIENTIFIC PRESS.

PROCESS OF SEPARATING METALS FROM THEIR ORES.—No. 832,563; George H. Waterbury, Denver, Colorado.



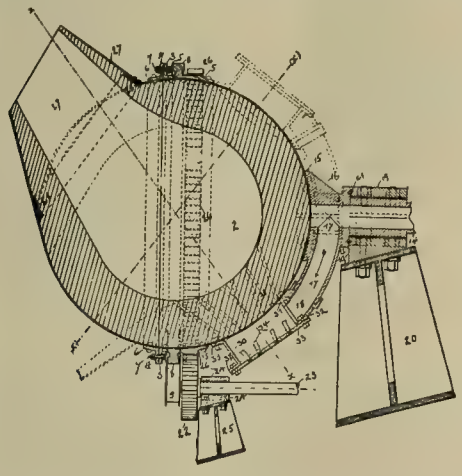
The herein-described leaching process consisting in placing suitably pulverized ore in a tank containing a solution composed of water, common salt, alkali-metal nitrate and sulphurous acid, and subjecting the pulp thus formed to the action of air and steam simultaneously introduced.

MEANS FOR DISTRIBUTING MINE RESIDUES, &c.—832,714; August L. E. Bergert, Johannesburg, Transvaal.



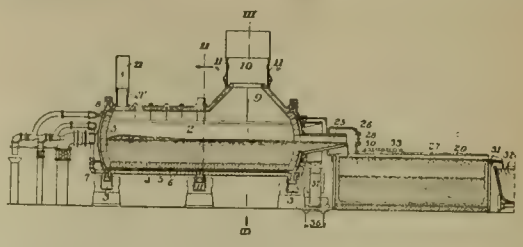
In apparatus of the nature specified the combination of a carriage, a vertical rectangular frame having its top and bottom pivoted to said carriage, a shaft in said frame extending at right angles to the axis thereof and a boom having its rear end connected to said shaft.

APPARATUS FOR CONVERTING MATTES AND SPEISSES AND OTHER METALLIC COMPOUNDS.—No. 832,665; Herbert Haas, San Francisco, California.



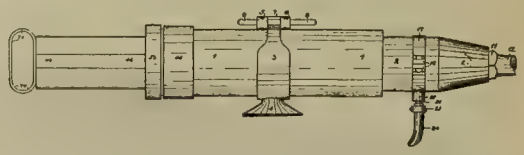
A converter for converting copper and other mattes and the like having formed in the lining thereof conduits arranged about a central axis, and opening upwardly through said lining and in a direction oblique to the plane through the orifice of the conduit and said axis and in the same angular direction therefrom, whereby the momentum imparted to the mass in the converter by the blast of air through each conduit is in the same direction of rotation, substantially as described.

METHOD OF EXTRACTING METAL VALUES FROM ORES.—No. 832,833; Ralph Baggaley, Pittsburg, Pennsylvania.



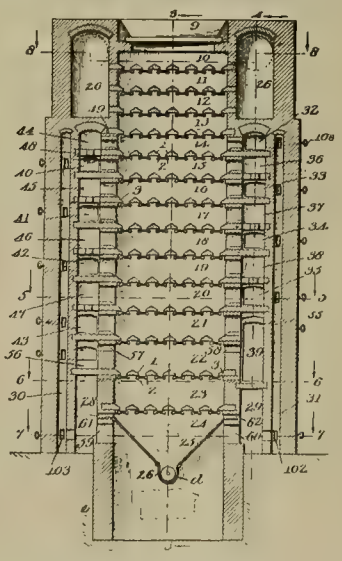
The method of extracting metal values from ores through liquation without carbonaceous fuel, which consists in feeding silicious ore to a bath of molten matte in excess of the amount that will flux with the constituents of the bath, and causing the excess portions of the ore to yield their values to the bath by liquation; substantially as described.

ROCK-DRILLING MACHINE OR ENGINE.—No. 832,791; Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal.



In a rock-drilling machine or engine, a rotatable power-cylinder having a side port at its forward end, a drill-steel slidably and non-rotatably held at said forward end of the power-cylinder, and having a passage extending longitudinally of said steel and communicating with the side port aforesaid, and a liquid-supply swivel loosely surrounding the forward end of the power-cylinder and having a port in communication with the side port aforesaid.

PROCESS OF TREATING SUBSTANCES BY THE AID OF HEAT.—No. 833,679; William B. Dennis, Blackbutte, Oregon.



The process of treating materials by the aid of heat, which consists in causing the material and the heating medium to travel from the cooler part of the apparatus to a hotter part thereof at rates of travel independent of each other, substantially as described.

Engineering Building of the University of Pennsylvania.

On October 19, the University of Pennsylvania opened the new building devoted to engineering education. The completion of this large and fully equipped structure marks the growing importance of the engineering profession in America.

The new building is the largest of the 70 buildings comprising the present university group and has a frontage of 300 ft. and a depth of 210 ft. at one end and 160 ft. at the other. Including equipment the building has cost upward of $800,000. It is fireproof, three stories high, in addition to which there is a basement covering about a third of the entire site, bringing the total floor area to about 128,000 sq. ft. It is heated by a direct steam system, each room being heated by steam coils supplied with low-pressure steam exhausted from the university's light and heat station. Electrically driven fans, placed in the basement, force air into all the living rooms, and other fans in the attic exhaust it from the toilets. By sub-dividing the system into sections, each independent in itself, it is possible to operate only those associated with any part of the building which may be occupied at one time. The motors are controlled from points convenient to the instructors in charge of the departments served. The building is lighted by electricity and the scheme for illumination has been very carefully worked out, first with respect to securing the best lighting and second to providing a pleasing effect in the illumination.



UNIVERSITY OF PENNSYLVANIA. NEW BUILDING FOR THE ENGINEERING DEPARTMENTS 1906.

Current is supplied during times of small demand directly from the central station, and when the demand is large from the local plant in the centre of the basement. This plant consists of one 25-h.p. and two 75-h.p. Westinghouse standard engines directly connected to General Electric generators. Steam for the engines is supplied from the central station and after being used by the engines is sent into the heating system of the building. The lighting of the halls and library is by 50-c.p. Meridian lamps. The classrooms are lit by clusters near the ceiling. The drawing rooms and laboratories are lit generally by five-ampere enclosed arc lamps placed about 15 ft. apart, each provided with opaque bottom shade and concentric diffuser.

The east end of the building is devoted to the civil engineering department and the west end to the mechanical engineering. In the basement are locker rooms, lavatories, machinery for heating and ventilating, storage battery rooms, laboratories for geodetic and hydraulic work, and testing materials for construction. At the front of the first floor, between the two main entrances, are the offices of the heads of the departments. The remainder of this floor is taken up by the various laboratories and testing rooms. Two large light wells terminate in skylights over the ground floor, and in this central space, which is about 50 by 200 ft., are the various workshops.

On the second floor a reference library and reading room occupy the central space at the front of the building. The library and stack at one end will hold 20,000 volumes. The latter is flanked on either side by a series of recitation and lecture rooms, which are continued along both sides of this floor. Between the light wells at the centre of the building is a students' assembly room with about 2,500 sq. ft. of floor space. There are also a number of rooms for instructors along the south side of the light wells. The rear portion of this floor for nearly the entire length of the building is assigned to drawing rooms. A separate room will be allotted to each class and an individual desk to each student. In the extension on the west side is an alternating current laboratory, with facilities for two and three phase work and photometric work. An instrument repair-shop is adjacent to this laboratory.

On the third floor is a large room for the use of the engineering societies, and the general supply store and the library extend through the middle of the centre of the building, the space along the front being otherwise assigned to classrooms and to instructors' rooms along the south of the light wells. In the east and west wings spacious rooms have been set aside for engineering museums. The rear of this floor is also devoted to drawing rooms, which, like the drawing rooms on the second floor, will have the full advantage of north light through windows of ample dimensions.

Books Received.

A booklet entitled ESTUDIOS DE MINERIA PRACTICA, by M. Aurelio Denegri of the Lima School of Mines, has been received; it describes the practice at the mines at Collaracra, Peru.

THE DESIGN OF STEEL MILL BUILDINGS and calculation of stresses in framed structures by Milo S. Ketchum. Published by The Engineering News Co., New York. This is the second edition of a book that is intended to provide a short course in the calculation of stresses in framed structures, and to give a brief description of mill-building construction. In the discussion of the latter the aim has been to describe the methods and the material, together with a brief treatment of the design, and the estimates of weight and cost. The first edition proved most successful and to this one there is added a good deal of valuable material. The price of the book is $4 and it can be purchased through the MINING AND SCIENTIFIC PRESS.

THE COPPER HANDBOOK. A Manual of the Copper Industry of the World. Vol. VI. By Horace J. Stevens, Houghton, Mich. This valuable annual publication is a little late this year by reason of the illness of the author. Nevertheless, as heretofore, the volume is full of good matter and will strengthen the excellent reputation won by its predecessors. At a time like the present, when copper mining is in the ascendant, a statistical and technical compilation such as this ought to be on the desk of every mining man and investor. We have frequently had reason to test the data given concerning particular mining companies and it is not too much to say that Mr. Stevens has been proved to be invariably accurate and fair in his appraisal. The book is honestly and carefully done.

Publications Received.

CALIFORNIA MINERS' ASSOCIATION ANNUAL, 1905. This volume of proceedings is not less welcome for being late. The publication was about complete when the earthquake-fire in San Francisco destroyed the page proofs and the original copy. It was only with much difficulty that the matter now published was secured from various members. It is a creditable volume and contains much that is of interest.

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Editorial.

THE CALIFORNIA MINERS' ASSOCIATION has been in session during the past week, but the California miners were not there. The attendance was restricted largely to the little coterie that has been keeping the Association alive during the last few years. As there was no definite program announced nor any papers of special interest, it was hardly to be expected that a representative attendance would be secured. The Association came into being and maintained its vitality for many years on an issue which is now dead; the question of hydraulic mining has been settled by the logic of events and more good can be done by dropping it for a while, until the test case, still pending, has been passed upon. In the meanwhile it is hopeless to expect the maintenance of general interest in a dead issue. Mining in California is not confined to hydraulicking, and the association will serve no particular usefulness until it manages to enlist the support of those who are mining vein gold and developing our important copper resources, not to mention a dozen other metals. Another matter of much greater importance to the Association than to us, is the refusal to permit publication of the papers that are read. These will probably appear a year hence, when their interest will have vanished. It is a small idea and defeats its purpose. Under existing conditions the Association is not likely to get papers of any moment. In fact, the Association needs a broader spirit, and a policy worthy of its proud title.

A GOOD WINE needs no bush, and a contribution such as that on 'West Australian Gold Mining Costs,' requires no endorsement in the editorial columns. It is one of the most useful papers on the economics of mining that this, or any other technical paper, has been enabled to publish. The personal equation in this case is splendidly confirmatory, for Mr. H. C. Hoover and the experienced mine managers who contributed the data, are among those who write with authority, and not as the scribes.

AMONG MINING enterprises none compare in interest with the excavating of Herculaneum, an undertaking about to be started by the Italian Government. This ancient city was buried under eighty feet of volcanic mud, which is now rock. Under this vast blanket lie buried the treasures of Greek art and literature of nearly two thousand years ago. The neighboring town of Pompeii was only a commercial town and a cheap place of amusement; it was to Herculaneum as Long Branch is to Newport. Pompeii was greatly damaged by earthquake long before its burial and it had been flimsily rebuilt, while Herculaneum when it was sealed to silence was a real centre of Greek civilization. Already one villa that has been unearthed has yielded a whole library

of papyri. The operations about to be systematically started ought to be as exciting as pocket mining in Calaveras county.

The Greatest Loss.

We have dwelt upon many features of the earthquake-fire that turned the sympathies of the world toward San Francisco in April. There remains one lesson and the chiefest of all, which we have reserved for special consideration. We refer to the loss of information in notes and manuscripts belonging to our engineer friends that, being written on perishable paper, without a duplicate, were consumed irretrievably in the flames. One family of engineers, a father and two sons, possessing a large stock of data gathered during two generations of intelligent activity, lost every scrap of the knowledge that they had expected to perpetuate in writing, for their own use and for other members of the family. Two engineers who were specialists in dredging and placer mining, possessed of a fine collection of drawings of machinery and records of practice, lost all these. Such instances could be multiplied, but it is not necessary; it requires but little imagination to appreciate the tremendous amount of individual knowledge in written form that perished utterly during the catastrophe. It was individual and that is why it exists no longer; had it been given to the profession, in the form of literary contributions to technical societies or to professional periodicals, it would be available today, for the benefit of the world at large and incidentally for the use of the men who hugged it closely to themselves. There is no waste so complete as the waste of experience, there is no gift more useful than the record of professional practice. There are men who, from mere laziness, postpone the act of systematizing the data they have collected and the publication of them in such form as will render the information of service to others; for these men one has sympathy, for to be lazy, especially after hard routine work, is human enough. But what shall be said of him who, collecting the little special knowledge that every man can accumulate after a few years of work, prefers deliberately to put it away in a safe, so that the exclusive benefit, if any, of it, may be his and his alone; he makes up his mind that no competitor shall have it and as for the rest of the world, such as students and the younger fellows whom it might help, why should he give it away to them for nothing? So the greedy tongues of flame sweep through his office and shrivel the selfish manuscript to a cinder. Shall we be sorry for such a man? Yes, but not for his loss of data so much as for the narrow spirit that chooses to live and work to itself.

Sentiment aside, a big fire proves the danger of omitting to duplicate valuable manuscript or even notes and drawings, and of all the ways of multiplying the record, none is so simple as that of putting it into print. Some of us lost the notes of twenty years, but when we realized it there came the pleasant reminder that the best of it had been already put together in the form of material published in transactions and books, of which there were so many copies and so scattered that no single disaster could destroy them all. Whether they were of small or large value mattered little, they were ours, the children of our brain, and they lived, to be a part, however unimportant, of the general reference library of the profession. But we can meet the least altruistic engineer on his own ground, for we venture to say that he who never goes beyond the note-book stage or the individual record of work that is prepared for personal use, will never go far and rarely possesses as much as he would if he took the next step, namely, that sifting of data and refining of judgment which are required for the act of publication. Any man who has ever started to put together his information on a particular subject, need not to be reminded how soon he found it was like a garment only half woven, full of holes and unready for use. No one learns as much from his writing as the author, it is an education that continues throughout life, and it is the one that best brings home the limitation of human attainment. So, gentlemen of the profession, put the best that you have into print, for fear of otherwise losing it, and with a purpose generous as the inheritance of knowledge that has come to you without money and without price.

Maps.

Among the useful publications of the United States Geological Survey none are more valuable than the maps furnished by that scientific bureau. Not only are special sheets issued, but in every report and treatise one is sure to find one or more useful maps covering the regions described in the text. Maps are to the geologist and the mining engineer no less valuable than to the intelligence department of an army, and it is a notable fact that as a rule this necessary adjunct is omitted in many books and other publications where they are required to make the descriptions intelligible. Lately we have begun to insert small maps in the pages devoted to mining news; believing that the reference to them will be serviceable. It is astonishing to find so many valuable books of travel and of general information, dealing with unfamiliar regions, that are unprovided with such guides to a clear understanding. People write about distant countries and comparatively unknown localities without affording a clue as to the whereabouts of the places mentioned. Take, for instance, so useful a book as 'The Gold Mines of the World'—there is not a map in it, although it is obvious that to many of those that read it, the geography of the goldfields of Madagascar, Burmah, Korea, and even Alaska, India, and Australia, must be painfully vague. We have known the Mt. Morgan mine to be placed in New Zealand by an editor who is usually well-informed and we have seen Bendigo debited to Queensland by an authoritative technical journal. This is due to the scarcity of those little sketch maps that tie the unknown to the known, the new district to the old city, the ephemeral mining camp to the established centre of trade. To follow the development of the mining regions of the world it is necessary to begin with a correct notion of geographic relations. We purpose contributing to this need, and we hope that our readers will help by favoring us occasionally with a sketch map of their own locality, especially if it be the scene of unusual mining activity.

By the Way.

In a recent address delivered by Mr. James Douglas at Columbia University, he said:

In deciding where it is most economical to reduce ore to metal, the cost of transporting the raw material, the fuel, and the finished product to the most profitable market are the determining factors.

There are some strange contradictions of this rule, as, for instance, the persistency with which the copper and brass trade adhere to the Naugatuck valley in Connecticut. It has been an old industry there, for Warden in 1819 says: "Metal buttons have been manufactured at Waterbury and New Haven of which the annual amount has been estimated at $100,000." And there are ill-suited locations of some of our large iron works which were started originally near some small iron deposits now exhausted, or on a water power, too trifling to be used today, but which survive as geographical anomalies because the necessity is not yet urgent enough to oblige the owners to wipe out the large capital invested. But our more progressive corporations are taking this radical step, as instanced by the owners of the Lackawanna Steel Co., whose owners have transferred their works from Scranton to Buffalo, while their name alone perpetuates their former prosperous existence in the heart of Pennsylvania. If we assume, for instance, that at present two tons of Lake Superior ore make one ton of pig iron, and that one ton of fuel is consumed in reducing them to one ton of pig, and this pig iron is used up in the East, then two tons of cheaply handled ore are transferred to Pittsburgh, whereas if that ore were reduced at the mine, one ton of fuel, whose transportation (owing to its bulk) is more costly than that of a ton of ore, would have to be carried from Pennsylvania or Ohio; and one ton of pig of high value, and therefore commanding a higher freight rate, would of necessity be shipped back to the Eastern market. Under either condition four tons of freight must be shipped to lay down a ton of pig in Pittsburgh—two tons from west to east, and two from east to west; but the east-bound ore can be handled with less loss and at less cost than coal and coke could be carried West and pig iron East. Therefore, up to the limit of the demand of the Eastern market for pig iron, it is cheaper to make it of Lake Superior ore in Pittsburgh than to make it on Lake Superior. But the Western market is rapidly growing, and new works are being laid out on Lake Michigan, rather than either in the heart of Pennsylvania or on Lake Erie, for both Michigan and Minnesota ore can be laid down more cheaply on the shores of Lake Michigan than at any point in Pennsylvania or Ohio; and though the great central coal basin does not yield a good coking coal, it does produce cheap fuel for converting pig into finished product. Last year the shipments of iron ore from Lake Superior amounted to 34,353,456 tons. Of this, 84.4% was transferred inland by rail to ports on Lake Erie; the balance—5,369,098—was shipped to points on Lake Michigan.

As, however, the West grows—and the West is shifting always to points still farther west—its demands for iron grow almost more rapidly than the East, and the centre of manufacturing will continue to move westward. This tendency we see in the rapid expansion of the only large iron and steel organization west of the Missouri—the Colorado Fuel & Iron Co. While in 1900 its furnaces at Pueblo made only 150,204 tons of pig iron, they made 407,774 tons in 1905. And yet these furnaces depend on long distance freight for their supply of ore! Some of it comes over a haul of 700 miles from southern New Mexico, and much of it comes from Wyoming and distant points in Colorado. But the fuel supply is near at hand in the Trinidad coalfield.

We know of no iron deposits in the West comparable in size to those on Lake Superior, but there are many which can be profitably worked. Though within our own territory west of the Great Salt Lake Basin we have no good coking coal, our neighbors to the north can supply it, or we can draw it from New South Wales, which already has shipped coal for railroad purposes to the Pacific Coast. From our other neighbor on the south, should iron and steel works be started on the west coast, we can draw ore from the large deposits said to lie on the very seashore near Acapulco, for distance is being rapidly obliterated by steam, and by it also let us hope international selfishness and commercial exclusiveness. Literature is tending to unify the race and commerce, through the railroad and steamboat, is another beneficent force working to the same end. As people come to know one another better, under a process of natural selection, they will surely imitate and adopt each other's better qualities, and, without losing their national idiosyncracies, acquire a higher cosmopolitan character.

In a recent issue of *The Outlook*, the elections are interpreted thus: Politically the country has been growing democratic; industrially it has been growing autocratic. The discovery of natural forces and the laws which govern them, the growing ability to use them in the service of men, the recently developed ability to co-operate in organized industry, the invention of division of labor, the vast increase of wealth—an increase more rapid than the increase of moral intelligence properly to value and rightly to use it—have combined to create great captains of industry, who have taken the place of the political commanders of the older epoch. We have abolished kings and substituted railway kings; have abolished lords and substituted coal barons. Our industrial systems are founded on the principles of feudalism, with this difference: The industrial overlord owes no protection to his men, and may discharge them when he will; they owe no loyalty to their overlord, and may leave his service when they will. But they have no share in the direction of the industry, and only incidentally and indirectly, if at all, any share in its profits over and above the necessary cost of production.

These overlords are sometimes high-minded, noble-spirited, generous men; they are sometimes mean, niggardly, unscrupulous men; but whatever their character, they are overlords. Their prosperity often depends on legislation. Sometimes unscrupulous politicians threaten them with unjust legislation against which they must protect themselves; sometimes they desire special legislation to promote their industries. Hence the 'boss' and the 'machine.' All political parties must have leaders; when the leader becomes a servant of the plutocracy, he is a 'boss.' All political parties must have organization. When the organization becomes tributary to the plutocracy, it is a 'machine.'

Thus there have been growing up in America simultaneously, neither really conscious of the growth of the other, two powers—Democracy and Plutocracy. There is an irrepressible controversy between them. One of them will eventually destroy the other. Shall government become autocratic, or shall industry become democratic? This is the fundamental question before the American people today.

Observe: The people do not object to kings merely when they misbehave. They object to kings good and bad. They do not object to plutocrats merely when they misbehave. They object to plutocrats good and bad. As they objected to the concentration of political power in an oligarchy, so they object to the concentration of industrial power in a plutocracy.

Special Correspondence.

London.

Old Cornish Mines Re-Opened—Wheal Buller—Rich Ore in Dolcoath—Decreased Tin Production From the Malay States—An Old Irish Copper Mine—West African Results—Half-Yearly Report From Mt. Lyell—Mt. Cattlin Copper Co.—A West Australian Lament—Mexican Returns.

Cornish mining continues decidedly on the up-grade. It is said that the capital for Botallack Mines Ltd. was largely over-subscribed. Other resuscitations are to be heard of shortly. According to *The Cornish Post*, the once famous and profitable copper and tin mine Wheal Buller, in the parish of Redruth, is about to be re-worked on the limited liability principle. It is proposed to form a company with a capital about £50,000, but it is not probable that one-half of this sum will be required to re-open the property and bring it into a producing stage. Wheal Buller, which adjoins the Basset mines, was started in October, 1848, with a capital of £1,280 in £10-shares. The company commenced to pay dividends four months later; altogether the shareholders reaped £243,392, or £1,910 per share. The first dividend was £10 per share. When the number of shares was increased to 250, they were sold at £1,000 each. In its progress, no mine of those times was so rapidly developed and placed so soon at the head of the industry. The principal lode (copper) became productive at a shallow depth, yielding 20 tons of ore per fathom, at 20 fathoms only below the adit level. Altogether 83,910 tons of copper ore were sold, realizing £484,770. Immediately under the huge bed of copper, tin was discovered and £95,195 was secured by the sale of it. The tin lodes were found in the eastern part of the sett, while the pumping-engine had been placed on the opposite side—over 200 fathoms away. This necessitated pumping by the aid of flat rods, which frequently broke down; and although the miners were actually engaged in raising tin from a productive lode, the then executive suspended operations rather than go to the cost of erecting a pumping-engine in the eastern part of the property. The pumping charges were small, owing to the shallowness of the mine and of its granite formation. The lease of Wheal Buller is most liberal. It is granted by General Sir Redvers Buller for a term of 40 years, and Cornishmen will be glad to know that dues will be paid on profits only.

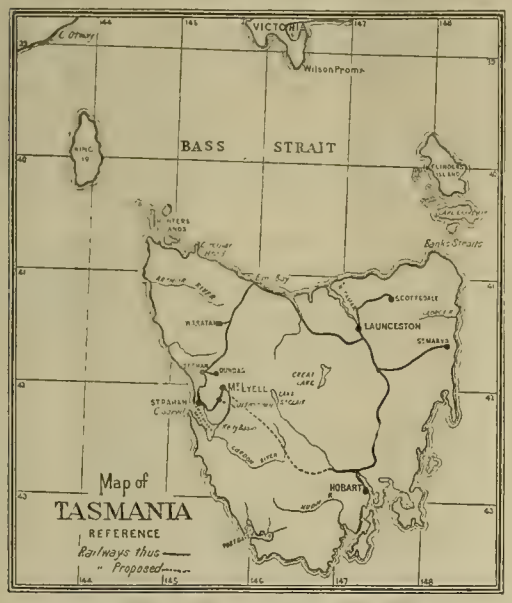
At the bottom of Dolcoath, the lode is reported to be producing 1 cwt. tin per ton, and it is said that £500,000 worth of tin ground has been blocked out for stoping. These bright prospects at the bottom of the mine are considered to justify the re-sinking of Williams' shaft. Cornwall is endeavoring to do something to make up the deficiency in the Straits' supplies which has largely accounted for the rise in the price of tin. Official reports from the Federated Malay States show that in the first nine months of the current year the exports of tin, including metal contents of ore shipped, amounted to 608,381 pikuls, as compared with 636,191 pikuls in the corresponding period of last year and very much larger quantities previously. (The pikul is equal to 133⅓ lb.) The Irish copper concern, the Bonmahon Copper Mines Development Syndicate, whose capital is £30,000, is about to expand into a company with a capital of £200,000, of which £75,000 has been guaranteed for immediate working capital, and £40,000 in shares will be held in reserve. It is claimed that the estimates of the prospectus have been so far confirmed, and that there is an unlimited supply of ore averaging 4% copper, which can be easily mined and concentrated. At first it was feared that seawater might be encountered in the mine, but from a recent report it appears that the greatest trouble experienced was not in the extraction of the water, but in the extraction of the old timber in the shafts. The timbering in the days of the old company must have been executed by past-masters of their craft, and the pumping machinery, under the present conditions, could not be installed with the system of timbering adopted by the old miners. The timber, which is as hard today, if not harder, than it was at the date it was put into the mine, had not only to be cut out, but in some cases had to be blasted out.

The Abosso Gold Mining Co. occupies a unique position as regards West African properties in having reached the dividend-paying stage. During the financial year to June 30 there were crushed 44,704 tons from which 35,689 oz. fine gold were recovered, realizing £152,256. The result was a profit of £58,637, from which a dividend of 10% is to be paid. As much as 92.15% of the gold contents was extracted, and the slime is still to be treated. The average yield per ton crushed was 15.96 dwt., and the total expenditure, including maintenance of works and mine redemption, averaged £2 per ton. The ore reserves amounted to 110,376 tons, of an average value of over 18 dwt. per ton. This is 35,723 tons in excess of the ore developed a year previously, and represents two and a half years' supply for the mill at the present rate of crushing.

A cable from the head office of the Mount Lyell Mining & Railway Co. in Melbourne gives the totals of the ore treated during half-year ended September 30: Mount Lyell mine, 133,668 tons; North Mount Lyell mine, 58,564 tons; total, 192,232 tons, averaging 2.52% copper, 1.71 oz. silver, and 0.067 oz. gold. Metal-bearing fluxes, 6,450 tons. Purchased ore, 607 tons. Produced, 4,491 tons blister copper. Operations (other than chemical works) for the half-year have resulted in a net profit of £239,397. According to estimates submitted by the general manager, the position of the ore reserves at September 30 was as follows: Mount Lyell mine: Available for open-cut extraction down to No. 5 level, 1,342,000 tons. Estimated average contents: 0.6% copper, 1.92 oz. silver, 0.044 oz. gold per ton. Available by underground mining below No. 4 level, 2,614,000 tons. Estimated average contents: 0.52% copper, 1.97 oz. silver, 0.025 oz. gold per ton. North Mount Lyell mine: Taking North Mount Lyell ore reserves as inclusive of extension to Lyell Tharsis mine, the figures are as follows: Available by means of open-cuts, 5,293 tons; available for underground mining in main orebody, substopes, and subsidiary bodies, 65,367 tons; in new developments, including east stopes sub-stopes No. 1 and 2 above and below 700 ft. level, 244,954 tons; Lyell Tharsis mine, 6,547 tons; total, 322,161 tons, representing an accession of 189,000 tons during the half-year less amount extracted and smelted during the period. Large portion of last figure, however, is represented by reserves estimated to exist below the 700-ft. level.

The Mount Cattlin Copper Mining Co. has been formed with a capital of £200,000 in £1 shares, which are offered for subscription at par, to acquire and work the copper mining property known as the Mount Cattlin mine, situated at Ravensthorpe, in the Phillips River district of Western Australia. The property comprises an area of about 50 acres, and prior to its acquisition by the present owners, the Phillips River Gold & Copper Co., Ltd., a considerable amount of prospecting work was done on the property. Since that date active development work has been carried out, under the direction of their mining manager, Mr. F. W. Morgan, the outlay being estimated to have been upward of £20,000. The property has been examined and reported upon by Mr. F. W. Morgan, Mr. G. C. Klug (late manager of the

Great Boulder Perseverance, who is now general manager of the Phillips River Gold & Copper Co., Ltd.), and Mr. W. H. Trewartha James. Mr. Klug states that the approximate tonnage and value of ore reserves is 21,200 tons, averaging 5% copper, 5 dwt. gold, and 9 dwt. silver per ton, and expresses the opinion that the mine will develop into a fine property; Mr. James, after carefully examining the property, cabled that on the present appearance and prospects he considers the Mount Cattlin a valuable property and a very desirable acquisition; while Mr. Morgan reports that there are three shoots of ore and estimates the tonnage of the ore reserves at 20,500 tons, containing 5.12% copper, 4 dwt. gold, 9 dwt. silver per ton, without taking into account many thousand tons of low-grade ore. Arrangements are to be made with the Phillips River Co. for treating the ore at their smelter at Ravensthorpe, and the Company is expected to



commence smelting operations at an early date. —— The chairman of Zoroastrian Limited, at the meeting for reconstruction of the Company (for the third time) lately, in referring to their disappointments and the state of "suspended animation" observable in West Australian mining, remarked that their experience was the same as that of other companies in the Bardoc district. The reef everywhere was erratic in value; they got places exceedingly rich, which lured them on to further expenditure, and when they had embarked on that expenditure they found it would have been better to have left it alone. The conclusion to which the directors had arrived was that under the present conditions of labor the Zoroastrian would not pay to work. They had a mine admirably equipped with machinery, and they were doing a good business in public crushing and cyaniding other people's tailings. By that means they were almost paying their expenses in Western Australia. He did not want to indulge in eloquence at the expense of the Labor Party in Australia, but the trade unions there insisted upon the payment of £4 per man per week for underground labor. That was all very well for the rich mines of Kalgoorlie with 1-oz. and 1½-oz. ore, but to a struggling undertaking up-country like the Zoroastrian, and hundreds of others, such a charge was prohibitive.

For results Esperanza (Mexico) is still to the fore, as may be seen from the return for October: The mill ran 29 days and crushed 13,810 tons of dry ore; shipped to smelter, 6,401 tons of dry ore; estimated realizable value of bullion produced, $146,858; concentrates, $76,571; ore shipped to smelter, $528,639; receipts from rents and other sources, $548. Profit at the mine, $474,713. The report of El Oro is also to hand. The No. 1 mill ran 28 days, No. 2 mill ran 29 days, and together crushed 22,100 tons of ore, producing $171,469, less working expenses, $95,868, and development $11,056; profit, $64,545; profit from the railway, $11,797; total profit in Mexico, $76,342. The general manager adds: "More than usual amount of precipitates remaining on hand in zinc-boxes at the end of the month."

Calumet, Michigan.

Calumet & Hecla Raises Wages.—Big Dividends From the Copper Mines.—Lake Superior Men Operating in Arizona.—Another Incorporation.—Arcadian Transfer to the Quincy.—The Mohawk Dividend.—Railroad Construction.

Announcement of a 10% increase in the wages of all employees at the mines and stamp-mills of the Calumet & Hecla Mining Co. was made a few days ago, the raise to become effective in January. This affects between 5,000 and 6,000 men and it is estimated that it will increase the payroll fully $500,000 per annum. The Calumet & Hecla Co. has always been noted for liberality toward its employees; it is one of the most magnanimous corporations in the world; not only does it pay the highest wages in the Lake Superior Copper district, but it furnishes its employees with dwellings, hospital service, and other things at nominal prices, and provides a free library, baths, etc.

Although the Lake Superior mines are now working the largest forces in their history, and wages are the highest ever known, there is room for more men. But with the advent of winter and consequent curtailment of surface work more men will be available underground. The prosperity resulting from the present price of copper is not confined to the mining companies, nor to the employees of any single corporation, but is being shared by all alike. The Copper Range Consolidated, Wolverine, Mohawk, Tamarack, Osceola, Isle Royal, Quincy, and other mining companies have increased the wages of their men at different periods during the past few months. The Calumet & Hecla, however, always pays slightly higher wages than the other mines and its action in adding another 10% on the first of next year may eventually result in further increases by the other corporations, in which event upward of 18,000 men would be affected.

Laboring men are very prosperous in all the copper mining districts, owing to the strength of the metal, and wages have recently been advanced in the Butte and Bisbee districts. Dividend payments by the copper mines this year will break all records in the Lake Superior district. With the payment of its $20 quarterly dividend the latter part of this month, the Calumet & Hecla's disbursements to its shareholders will have reached $99,350,000, a record without equal in the annals of the mining industry. Dividend payments by leading mines in the next four weeks will be as follows: Calumet & Hecla, $2,000,000; Calumet & Arizona, $800,000; North Butte, $800,000; Copper Range Consolidated, $767,562; Quincy, $250,000. These mines, with the exception of Calumet & Arizona and North Butte, are situated in the Lake Superior district, and the other two are dominated by Lake Superior capital.

The organization of the Superior & Boston Copper Co. was perfected here a few days ago. The new concern is to take over the property of the Globe & Arizona Development Co., together with 20 additional claims, making a total of 41 full and fractional claims adjoining, on the east, the Old Dominion and the Arizona-Commercial properties, at Globe, Arizona. The new company is

capitalized for $1,500,000, in 150,000 shares of $10 each. Of this amount 15,000 shares went in part payment for the properties and the balance of 135,000 shares was sold at one dollar each, nine dollars being subject to call. The stock was heavily over-subscribed in a few days. The officers are: President, James Chynoweth, general manager of the Centennial and Allouez mines; secretary and treasurer, William G. Rice. In addition, the board of directors includes Norman W. Haire, general manager of the Bigelow mines, Henry V. Snell, general manager of the Arizona Commercial, and J. H. Rice, vice president of the Houghton National Bank. The main offices of the company will be at Houghton. Recent developments on the 400 and 500-ft. levels of the Black Hawk claim of the Arizona Commercial prove the orebody to a point within 14 ft. of the end line of the Superior & Boston ground. The new railroad, built by the Arizona Commercial to its Black Hawk shaft last summer, gives the Superior & Boston standard-gauge railroad facilities.

There has been filed in the county office at Houghton a deed transferring from Arcadian to the Quincy 800 acres of land, described as follows: The north half of Section 1, 55-33, and the north half of the southwest quarter of Section 13, 55-34. The document is dated November 19, and is signed by Albert C. Burrage, president of the Arcadian, and Charles D. Burrage, secretary of the same corporation. The consideration named is $750,000 in hand paid by the Quincy, the receipt of which is acknowledged. The deed guaranteed the land to be free from all encumbrances except the street railway, steam and wagon-roads holding rights of way across it.

There is much speculation regarding the dividend which the directors of the Mohawk Mining Co. will declare this month and which will be paid to the shareholders in January. The Mohawk's last dividend was three dollars per share and the previous one two dollars, making $500,000 for this year. It is intimated that the next dividend will be four dollars. The situation at the mine is quite encouraging, despite the low returns in copper secured from the Kearsarge lode. The construction next year should be light and production should be considerably increased.

Toronto, Canada.

Work at Manitou Lake.—News From Cobalt.—Several Interesting Strikes.—Copper Mining in Hastings County.—A Smelter Now in Operation.

Development work continues at the leading gold mines of the Manitou Lake district in northwestern Ontario, though no specially noteworthy strikes are reported. At the Laurentian, driving on the east vein is being done in a southerly direction and rich ore is being taken out.—— Dryden Smith, manager of the Little Master, is exploring the black quartz vein with satisfactory result.—— The shaft of the Paymaster mine is being put down toward the 400-ft. level under the direction of Mr. Manley, the acting manager.——At the Volcanic Reef, another contract for driving north from the shaft has been let.

Recent changes of ownership and capitalizations of Cobalt mines have in many cases resulted in large purchases of machinery to increase the production. The Cleveland-Cobalt Co., owning 114 acres on Clear Lake, has ordered $40,000 worth of machinery from the A. R. Williams Co., Toronto, and Allis-Chalmers-Bullock, including a gas-producer plant of three units and air-compressors. They will sink three shafts on the property. A vein which showed traces of silver at 25 ft. has proved rich in native silver and argentite at 45 ft. depth and widened to over five feet.

The Clear Lake Mining Co., which recently sold 45 acres to the Cleveland-Cobalt, retains 60 acres, known as the Timmins Extension, and has ordered an air-compressor and steam plant from the A. R. Williams Co. for sinking a shaft. —— At the McKinley-Darragh-Savage mine, on Cobalt lake, a coffer-dam is being built 100 ft. from the shore at the south end of the lake at a cost of $20,000. The intervening space will then be drained to facilitate the working of the veins now under water. A vein six inches wide, rich in native silver, has been found on the 50-ft. level. The shaft on vein No. 3 is down 30 ft. and the ore is rich in sulphide.

The first carload of ore shipped from the Foster mine has yielded returns of $26,070. —— The Green-Meehan on November 27 shipped its second carload of ore to the smelter. A report received from the manager, Charles O'Connell, states that in No. 1 vein rich ore has been struck 125 ft. from the north end of the shoot now being worked, leading to the conclusion that the orebody covers the interval.——Col. A. M. Hay, an experienced miner and one of the first on the ground at Cobalt, has been chosen president of the Tretheway company, and S. A. Wickett vice-president.——A good find has been made on the Mackay property, near Cobalt, ore carrying 200 oz. silver per ton having been struck at 25 ft. depth. The vein shows a width of two feet.

At the Eldorado copper mine, in Hastings county, Ontario, owned by the Medina Gold Mining Co., of which James B. Cook is superintendent, work has been energetically pushed since the installation of the smelter this summer. The shaft, which is 40 by 8 ft. wide, is down 140 ft. The width of the vein is 7 to 8 ft., the ore being chalcopyrite, and carrying an average of 7% copper. There is a daily output of 30 to 35 tons, which is reduced to matte in the smelter and shipped for further treatment to New Jersey. The plant is complete and includes an electric lighting outfit. An additional five-drill air-compressor is being put in. —— Other valuable copper deposits have lately been discovered in this district. James Best has begun the development of a 3-ft. vein, which grows wider as it is followed, at Bancroft.

Another find of rich copper ore has been made at Queensboro. The successful operation of the Eldorado smelter is likely to develop an important copper-mining industry in the district, and prospectors are eagerly searching for copper ore deposits.

Leadville, Colorado.

Boston Interest in Leadville.— To Re-open Sugar Loaf.— The Dinero Adit.— More Custom Mills.— Shortage of Cars and Lack of Labor.

The possibilities and advantages of Leadville mining properties as a field for investment is attracting Boston capitalists, and an investigation of the district is now being made by representatives from the Massachusetts metropolis. Leadville, as compared with other Western mining centres, is but little known in Boston and other New England towns. But the investigations made by the Eastern representatives have proved surprising to the visitors. Boston is principally interested in copper mines, and the Boston Stock Exchange every year handles more copper stocks than any other city in the country, not excepting New York. In previous years but little interest was shown in gold and silver properties, the capitalists preferring to put their money into well-known paying copper mines in Michigan. Of late the trend of popular opinion has changed, and gold and silver mines are receiving attention as well. Messrs.

K. P. Crawford and J. F. Dearborn are the Boston representatives here at present.

A new tunnel proposition, already well under way, to develop the mines on Sugar Loaf Mtn., has been organized by D. M. Gray and associates. Mr. Gray will manage the proposition, and states that the adit will be driven 3,045 ft. as a minimum. This adit will bear the relation to Sugar Loaf that the Yak tunnel bears to Carbonate, Breece, and Fryer hills. Sugar Loaf Mtn. has produced approximately $11,000,000 to date, and of this amount the Dinero is stated to have contributed nearly $1,500,000 from its two principal mines, the Dinero and Buckeye State. A number of years since work on the lower levels was discontinued on account of a heavy inflow of water containing a large amount of sulphuric acid. It was found impracticable to handle the acid water and development was limited to the upper workings. The adit will be run from the northeast bore of the mountain and will cut the vein at a depth of 900 ft., which will amount to 500 ft. below the present workings. The company contemplates installing an electric plant, which will provide power for drills, hoists, and



Montana.

transportation. A mill for treating the low-grade ore, along with the larger portion of the mammoth dump, which is estimated to contain several million dollars worth of ore, will be erected. The company was incorporated at $5,000,000 under the laws of Arizona, and is styled The Dinero Consolidated Mining & Tunnel Co. The general offices of the company are at Kansas City, Mo., with the mine office in this city. The adit will be the second longest in the district, and its network of laterals will ultimately be run to develop the adjoining properties. Thus it will rival the Yak tunnel in importance. The amount of territory owned and leased by the company amounts to a little less than 100 acres, and includes the Dinero placer claim, Dinero, Orinoco, Inez, Bull Dog, Pitcher, Buckeye State, Michigan Boy, and other lode claims. On the whole the Dinero is one of the strongest and most important companies that has been organized in the district for many years past, and will develop one of the most promising portions of the Leadville district.

The finding of considerable ore of shipping value in the tributary sections such as Big and Little English, French, Dutch, and Empire gulches during the present season has assisted materially in enlarging the area of the productive district. In Empire gulch the owners of the Eclipse leased—some months ago—their property to Peter Rawson. Under this lease more than 25 tons are being shipped daily to the Arkansas Valley smelter and the prospects for a large increase in tonnage seem assured.

The success that has attended the different custom mills erected in the district has induced others to come into the market. Among the new mills are the Boston & Arizona and Damascus. The buildings for the former are completed and the machinery will be installed by the middle of December. This mill will handle 100 tons daily by concentration and will treat custom ores. The Damascus mill will be equipped with magnetic separators, principally to treat products from other mills. The shortage of cars for shipping ore to the smelters appears to be of a serious nature at this writing. Not only has the dearth of cars been a serious drawback to producing mines, but the output of many important producers has been also curtailed for many weeks due alone to the fact that the smelters were not able to treat all ores offered. The explanation made is that the scarcity of labor at the Arkansas Valley smelter leaves several units of the plant idle that could otherwise be utilized.

Butte, Montana.

Sale of Barnes-King Mines—Important Transfer—Heinze and the Snow Storm—Reports From That Mine—The Goldsmith Co.—Butte & Bacorn—Encouraging Results—Jennie Dell Again—Copper in the Cable District—North Butte's Development.

The Barnes-King Development Co., organized in Butte during the past week, has purchased the Kendall mine and 22 other gold claims situated 21 miles from Lewistown, Mont., paying $1,200,000 for the property, which includes the mines named, a ranch of several hundred acres, a cyanide mill with a capacity of about 225 tons per day, and a good surface equipment at the mine. The new company is capitalized for 400,000 shares of $5 each. The flotation was made in Butte and New York and the entire stock over-subscribed several times. In Butte alone $1,400,000 was subscribed, as the property and the men at the head of the new company are well known here. It is the intention of the company to enlarge and re-model the mill, develop the mine and increase the daily output to about 450 tons of ore. At present the output is about 210 tons per day. The mine has been a constant producer for five or six years and has paid monthly dividends of $20,000 to $25,000. It is estimated that there are more than 2,000,000 tons of ore in sight. The engineers who examined the mine, sampled the entire workings and the assays have run from $3 to $45, the average being about $14 per ton. They also reported that the cost of mining has been less than $1.50 and of milling about 75 cents, and that with the improvements to be made the entire cost of both mining and milling should not be more than $2.25 per ton. In their opinion, with an expenditure of $150,000 the mine could be made to produce 400 tons per day. The property is opened with a shaft 250 ft. deep, and with tunnels and drifts 15,000 ft. in length. Among the engineers and experts who have examined and reported favorably on the property are Walter Harvey Weed of the United States Geological Survey, J. Parke Channing of the Tennessee Copper Co., and several engineers of the Amalgamated Copper Co., Amalgamated and Daly Estate interests control the enterprise. The directors include H. Carroll Brown, a banker of Baltimore; J. L. Gerard and W. T. Harkness of New York; J. C. Lalor of Anaconda, manager of the Daly Estate, and W. W. Cheely, a Butte publisher. The Barnes-King mines are the biggest gold properties in Montana.

W. D. Greenough, manager of the Snow Storm mine and one of its principal owners, says that F. Augustus Heinze has been negotiating for the purchase of a controlling interest, and offered to take the stock of Mr.

Greenough and his associates, amounting to more than 800,000 shares, but they could not agree on a price. Mr. Greenough adds: "There are close to 2,000,000 tons of ore blocked out in the mine, and 50,000 tons are on the dump at the mouth of No. 3 tunnel. We have developed an orebody 850 ft. long, 623 ft. high, and 40 ft. in average width, with good ore in the face of all the drifts. We now have enough ore blocked out to run continuously for 10 years, and are blocking out more daily. This great mass of ore will average 5% copper and 6 oz. silver per ton. Considerable of it is high-grade ore, and I do not believe any of it will go under 3% copper and 5 oz. silver. Taking the lowest grade of ore, at present metal prices, it would net the company about $7 per ton. I believe that the Snow Storm has greater possibilities than any mine in the Cœur d'Alene country, and it is certain that none of them have the immense tonnage of ore blocked out where it can be measured. The Snow Storm has an intrinsic value of $9 per share of measurable ore, which has been carefully sampled. J. C. Adams, superintendent of the Boston & Montana mines, says there is $9.50 per share, net money, blocked out and in sight, and in his opinion the No. 4 tunnel, which will cut the orebody 550 ft. deeper than the present workings, will undoubtedly find an enriched zone of copper glance. We are working on this tunnel and expect to complete it in about a year. We are also extending our drift on the No. 3 level west, and, as all indications of the orebody are to the effect that it rakes to the west, we expect to encounter the black sulphide on this level which occurs on the upper levels. Our new air-compressor is now completed and running nicely, and we expect to start the new 750-ton tramway within another week. We will then drop all of our ore to the No. 3 tunnel and put it over the new tramway. This ore should be mined and put on the cars for not to exceed $1.25 per ton. The Snow Storm will be able to mine and make copper at a profit when the metal price is so low as to compel many other mines to close."

James W. Neill is engaged in making an examination of the Goldsmith mines for the new Goldsmith Mining Co. If the report is favorable the company will take over the properties and proceed to develop the mine to a depth of 1,200 ft. The shaft on the Goldsmith is at present but 400 ft. deep, but to that depth the mine has yielded a great quantity of silver ore. Regular shipments are being made by the old owners to the East Helena smelter. The ore taken from the lowest level runs high in silver and about 3% copper. The Goldsmith is on the famous Rainbow lode, from which silver ore has been mined for many years, and it is the opinion of mining men that with sufficient depth the veins will be found rich in copper. Frank M. Sullivan, who floated the East Butte Mining Co. and other important mining concerns, is largely interested in the Goldsmith.

As the cross-cut continues in the Butte & Bacorn ground from the Colleen Bawn shaft, the company is growing more confident that commercial copper ore will be struck even at a depth of 300 ft. One stringer of ore 18 in. wide and another six inches in width have been cut. The value of the ore averages 31.2 oz. silver per ton and 3.15% copper. Picked samples returned 44.6 oz. silver, $7.20 in gold, 4% copper and 4.6% lead. The company has also decided to cross-cut from the 650-ft. point of the Belinda and the 550 of the Calumet, for the purpose of ascertaining the character of the country between the two shafts. A number of Butte mining men have examined the find in the Colleen Bawn and pronounced it identical in character with that found in some of the large copper mines of the district. The vein at 300 ft. is of about the size usual at that depth in Butte.

In addition to running the long cross-cuts from the Jessie to the Berlin claims, the North Butte has decided to sink a shaft on the Berlin claim itself. It had been the original intention to work the Berlin claims, in the event of copper ore being found, through the old shaft on the Speculator, through which all the North Butte ore is hoisted, but it has been found that that shaft will not be large enough to permit of a much greater output than the North Butte mines are now yielding. The company wants to add considerably to its production and another working shaft is necessary. Two cross-cuts are now heading from the Jessie workings toward the Berlin ground and they will connect with the proposed shaft. There is a two-compartment shaft on the Berlin 350 ft. deep; this will be enlarged and then sunk to a depth of 1,000 ft. at least. The North Butte mines have underground connections with the High Ore mine of the Anaconda Co. and connections are also being made with the Bell and Diamond mines of the same company.

Salt Lake City, Utah.

A New Smelting Company.—Exploration of the Frisco Contact.—Several Mining Deals.—The Yerington Ironsides Co.—The Ontario Adit.—Increase of Wages at Bingham.—Tintic Shipments.—The Coal-Land Investigation.

The articles of incorporation of the Tintic Smelting Co. have been prepared and will be filed within the next few days. This concern will be closely allied to the Utah Smelting Co., which has just begun the operation of a copper smelter near Ogden. Charles W. Nibley of Salt Lake will be president and Bela Kadish manager. The Tintic plant will be built with capacity for the treatment of 400 tons of lead ore daily. The site has been selected near Eureka, in the Tintic mining district. Several prominent Utah mine operators are large shareholders in the company, which appears to have the strongest kind of backing. The headquarters of the new company will be at Salt Lake.

The Talisman Mining Co., operating in Beaver county, has ordered a large mine hoist.——A vigorous campaign of exploration is in progress at the Frisco Contact property, where a drift is being run in a large body of low-grade copper ore. At the Lulu mine, in the same vicinity, a cross-cut is being run to connect with the Horn Silver mine workings as a means of perfecting the ventilation as well as safety. D. P. Rohlfing of Salt Lake is manager of both properties.——The Blue Bird group of copper claims, consisting of 300 acres of patented ground, has been optioned to G. D. B. Turner of Salt Lake, who is preparing to re-organize the company.——The Sidewinder Mining Co., with property in Stateline, has bonded its holdings to W. H. Bramel of Salt Lake and associates.

Articles of incorporation of the Yerington Ironsides Mining Co. have been filed here. The company will operate in the Yerington district of Nevada. A. Hanauer, Jr., is president; W. H. Tibballs, vice-president, and J. H. Turner, secretary. All are of Salt Lake.——The Ely Mining & Milling Co., which recently sold its property at Ely, Nev., to Salt Lake parties, has wound up its business and the proceeds from the sale have been divided among shareholders. The property formerly operated by this Ely company now belongs to the McDonald Ely Copper Co.

C. L. Rood, manager for the Ontario Silver Mining Co., at Park City, reports that the cross-cut run from the parallel drift has been cut into the main tunnel and that the avenue of timbers which have presumably drifted in from the mine are being taken out. Apparently, the last cave has been passed and the main avenue will be cleared without serious difficulty. With this accomplished, deep mining will be resumed in the mines that

have been flooded by reason of the stoppage of the adit for the past eighteen or twenty months.

The managers of the principal mines in Bingham, as well as the management of the Cactus copper mine in Beaver county, have voluntarily granted an increase of 25c. per day to their employees. The raise is to remain effective as long as copper sells at 18c. per pound or better.

Final payments have been made on the options held by Salt Lake and Boston parties on the property of the Bingham Copper Hill Mining Co., in Bingham. The group consists of 115 acres of ground which will be vigorously developed.——The Emma Copper Co., operating the old Emma mine at Alta, is driving several drifts from the Flagstaff tunnel. Some shipping ore has been found.

The ore shipments from the Tintic mining district last week amounted to 125 carloads, the contributing mines and amounts being: Centennial Eureka, 34; Eagle & Blue Bell, 10; Beck Tunnel, 9; Eureka Hill, 9; May Day, 2; Yankee Con., 2; Bullion Beck, 8; Victoria, 6; Grand Central, 3; Mammoth, 10; Carisa, 5; Ajax, 2; Gemini, 5; Scranton, 7; Tintic Iron, 8; Ridge & Valley, 2; miscellaneous, 3 carloads.——The second sitting in this city of the Interstate Commerce Commission to investigate the alleged coal-land frauds in this State and Wyoming has been concluded and resulted in bringing out much sensational evidence and placing some of the officers and agents of the Utah Fuel and Union Pacific Coal companies in a bad light. It is not improbable that criminal prosecutions will follow, in addition to the Government regaining title to valuable coal-lands.

Bisbee, Arizona.

Copper Production.—Important Discoveries in Three Mines.—Calumet & Arizona.—Superior & Pittsburgh. — The Cochise.—Enlarged Output From the Shattuck-Arizona. — Other Mining News.

It is understood from reliable authority that the production of copper at the Copper Queen and Calumet & Arizona smelters will be in the neighborhood of 13,000,000 lb. although the official figures cannot be obtained as yet. A little more than 1,000,000 lb. above the total is credited to the Shattuck-Arizona Co. The feature of the past week has been the discovery of ore in three of the local properties at places where such a development was unexpected. The largest strike of the three was in the Irish Mag shaft of the Calumet & Arizona on the 1,150-ft. level. The drift on this level was being driven in the direction of the Oliver shaft, owned by the same company, when a round of shots opened the full face of the drift into a body of oxide ore. Since the find was made, exploration work to determine its size has been going on steadily, but the proportions of the body have not as yet been determined. The new ore runs a little less than 9% copper.

The second strike was made in the Junction shaft of the Superior & Pittsburgh Co., and has added another producing shaft to the already large list of this company. Work was being prosecuted on the 1,100 level to make connection with the Briggs shaft, which lies southeast of the Junction, when the ore was broken into. It runs about 7% copper, and although the management will not state what the dimensions of the orebody are, it is understood from reliable authority that it is extensive. This is the first orebody of any size that has been encountered in the Junction, and the management feels that it will only be a short time before this shaft completely justifies the confidence which has been placed in it. The Briggs is the only shaft being operated by the Superior & Pittsburgh Co. in which a large orebody has not been encountered, but as the strikes of the past week are in very close proximity to this section, this shaft is liable to enter the producing class at any time. The third strike of the week was on the Cochise property, which lies north of what has been termed the Dividend Fault, and in a section of the district where heretofore recognized experts have said no ore would be found. On Thursday night the Cochise shaft was sunk into black sulphide, the exact value of which cannot be stated at the present time, but it is understood to be high. It is impossible as yet to say what the extent of this body is, as the exploration work has not progressed far enough. In this same shaft early



in the week a large body of low-grade ore was encountered in the drift on the 300-ft. level. The drift has been driven 48 ft. in the ore, and a cross-cut of 24 ft. has failed to show its full width.

At the Shattuck-Arizona, ore shipments have been averaging 300 tons daily, and it is stated, on the authority of the manager, that this schedule will be greatly increased before the end of the year. The new Allis-Chalmers hoist has been in operation for the past two weeks, and has given entire satisfaction. All of the shipping ore from this property is being taken from the 700 and 800 levels. On the 700 the two oxide and two sulphide orebodies are being stoped, and exploration work is being pushed forward. On the 800 three sulphide and two oxide bodies are being opened up, and the raises from this level to the 700 are both in high-grade sulphide ore. Sinking of the shaft was resumed within the past week, and on Wednesday was driven into low-grade sulphide ore. The new office building to replace the one which was destroyed by fire, is now in course of erection. Martin Pattison, one of the heaviest

stockholders in the Shattuck and Denn-Arizona properties, has been in the city during the past week on a trip of inspection, and before leaving for home stated that he was highly pleased with developments in both properties. It is understood that Pattison, Louis Hill, Guthrie, Barden, Chisholm, Williams, and H. V. Winchell, the noted geologist, all stockholders and directors of the Shattuck, will arrive in this city about December 16, and a stockholders' meeting will be held to settle the matter of constructing a smelter for this property. It is stated on the best authority that the construction of a smelter by the Shattuck people is settled, the only matter being left to decide is the question of time. Rumors have gone the rounds to the effect that a smelter would not be built until the Denn had been developed, but these rumors are based entirely on speculation.

At the Denn-Arizona development work is being carried forward, but there has not been anything of note. Sinking of the shaft is still going on, the depth now attained being 1,075 ft. A station will be cut at the 1,100-ft., and then the work will be resumed until the 1,200 mark is reached. —— At the Butte & Arizona property, in the Huachuca Mtn., there have been no new developments, the work being prosecuted along the contact. Plans have been formulated for the more extensive development of this property, but have not been made public as yet. At the Princeton property, in the same district, development work is being prosecuted, and some new machinery has been installed. —— Reports from Tombstone are to the effect that everything is about the same as usual.

Cripple Creek, Colorado.

Big Output From the Work Leases.—Elkton Doing Better.—Explorations in the C. O. D.—Shipments From the Index.—Another Leasing Company.—Last Chance to be Worked.—Granite Pays a Dividend.—Lots of Interesting News.

During the period from November 10th to the 20th there were shipped by the Work Co.'s lessees ore that gave returns of over $68,000. Of this the Work Co. received over $11,000 in royalties, the balance being paid to the lessees. It is stated that an extra dividend will be declared in December, as well as the regular quarterly dividend in January of one cent per share.——A statement has recently been issued by the Elkton Gold Mining Co. for the three months ending October 31. The gross production for that period was approximately $191,000 and an average of 1,150 tons was shipped per month, giving a gross value per ton of around $55. During the above period the stock has risen from 47 to 58c., about 27%.——The suit brought some months ago by E. J. Knight against F. R. Marsh for a $^{11}/_{32}$ interest in the famous lease of Marsh, Hodges & Co. on the Little Clara claim of the Work Co. has been decided in the District Court of El Paso county in favor of the defendant. The evidence goes to show that Knight did not lay claim to the interest in dispute until after the finding of the rich ore. The case involves the disposition of several hundred thousand dollars.

Ore is again being broken on the large vein encountered a few months ago at a depth of 440 ft. on the Arapahoe claim of the Jerry Johnson property on Ironclad hill. About 200 tons of ore giving returns of a little better than an ounce had been shipped from this depth, it then being decided to sink another 140 ft. and cross-cut for the vein at this lower level. It has been found that the vein where cut is not in pay, so that operations are again being conducted above. Frank Caley has this ground under lease from the Jerry Johnson Co. Connections were made at the lower level with the workings of the Forest Queen, producing good ventilation in both of these properties.——Work has been resumed by Clint Tillery and partners on the 800-ft. level of the C. O. D. property in Poverty gulch. It is proposed to cross-cut at this depth for the Gold King vein, it being estimated that about 100 ft. will have to be driven for this purpose.——Some rich ore has been obtained on the 700-ft. level of the Matoa property of the Stratton Estate on Gold hill. A streak in a winze has given assays as high as 10 oz. per ton. Reiton & Warmouth, lessees, have endeavored to locate this ore from below, but up to the present they have been unsuccessful. The ore as broken gives returns when shipped of $40 per ton.

Shipments continue to be made from the orebody recently discovered in the Index mine on Gold hill. The Ætna Leasing & Development Co. is operating this property under the management of William Foley. A car of ore was shipped to Pueblo this week, from which returns of several ounces per ton are expected. The ore is obtained at a depth of 360 ft. A similar orebody is being opened up in the Pointer Mining & Milling Co.'s property adjoining, which is thought to be an extension of that in the Index claim. Small shipments of high-grade ore have been made at times from a depth of 550 ft., but the above company, which has only been organized lately, will undertake extensive work to develop the property more thoroughly.—— A leasing company has been formed to operate the old workings of the Jennie Sample mine, on Raven hill; A. E. Carlton and S. S. Bernard are at the head of the enterprise and work will be commenced at once in the 300-ft. shaft. Some good strikes have been made during the year in the Ophir and other mines in the neighborhood and promising results are expected from this leasing company.

The work of preparing the Trilby mine, on Bull hill, for active development has begun and will take about a month. James C. Stewart is general manager. This mine was purchased by a Pittsburg syndicate from the Moose Co. two weeks ago.

The Mobile Gold Mining Co., owning the Last Chance claim on the northeast slope of Gold hill, has leased it to W. A. Riley of Anaconda. This property has been idle for the last five years. Work will be commenced at once, a favorable flat royalty of 20% having been obtained from the above company by the lessees. Extensive development will be done and it is expected that some of the rich veins being worked in the Little Clara, Dolly Varden, and Colorado Boss No. 1 claims adjoining will be encountered.——The Anaconda cyanide mill, situated on the south slope of Gold hill, is running to its full capacity. Low-grade ore is being treated from the South Clara D. workings of the Lexington Co., operated by the Union Leasing Co., and also dump ore of the Lexington Co., together with other custom ore from small shippers. Arrangements are being considered for increasing the capacity of the mill, which is now 60 tons per day. The cold weather experienced lately has interfered with operations, causing the freezing up of tanks and pipes.—— J. W. Dunston and associates have obtained a lease on the Alsa R. claim on Raven hill. This property is owned by the Golden Dale M. & M. Co., and is intersected by the Moose Co.'s property which cuts right across the Alsa R. claim. Work has already been started in the main tunnel by the lessees.

The ninth dividend to be paid by the Granite Gold Mining Co. this year has just been declared, amounting to $50,000 at the rate of four cents per share. This brings the total dividends for this year to date up to $150,000. Preceding the drowning out of the 10th level, this mine was shipping around 100 cars per month. During the month of November 39 cars were shipped from the Gold Coin shaft and 24 from the Granite shaft. The ore averages about $35 per ton.

Mining Summary.

ARIZONA.

GRAHAM COUNTY.

(Special Correspondence).—The Gold Belt Development Co. recently cut a wide streak of free-milling ore in their mine near Morenci which assays from $40 to $90 per ton. On this same lode at some distance to the east, they have a shaft down 40 ft. and the ore in the bottom averages two ounces gold. Another strike in the properties of this company which has attracted attention is that of a body of manganese-copper ore which is now being exploited, giving a general average of about 30%. Several tons of this ore are being taken out daily in development work, but as yet the extent of the orebody is uncertain. The existence of this body of ore has long been known to prospectors, who were under the impression that the manganese did not carry copper in paying quantities. This ore will be shipped to the Shannon smelter as soon as the road can be put in shape. The company's new hoisting plant is in commission, and the work of sinking the main shaft progressing. ——H. H. Harvey has closed a deal by which he disposed of the Pinal Mtn. group, comprising six claims situated about seven miles from Globe. The purchasers are Messrs. Davis & Howard, employees of the Old Dominion Co. The consideration is $75,000. Considerable development work has been done on the group.

Phœnix, Dec. 1.

CALIFORNIA.

INYO COUNTY.

(Special Correspondence).—John Salesberry, of Tonopah, Nev., has purchased the Sanger copper mine in the Ubetrebe district, and has a large force of men at work. J. V. McConnell, the engineer in charge, reports that the property is looking better as work progresses. There are 14 claims in the group, which have been cross-cut in numerous places on the surface, showing the orebodies to be from 75 to 300 ft. wide. The work at present has been confined to sinking. two shafts which have reached a depth of 80 and 90 ft. respectively. The ore is principally carbonate and native copper, and averages from 4½ to 7%. It is the intention of the new owner to continue sinking to the 500-ft. level. There are several other companies in the district that report excellent showings from their properties.

Big Pine, Nov. 24.

NEVADA COUNTY.

Work is being rushed on the property of the Consolidated Willow Creek Co., a bedrock tunnel being run at the Horse Valley gravel mine, 2½ miles northwest of Camptonville. The tunnel is now in 400 ft., and has 140 ft. yet to go. Additional compressors have been requisitioned, but on account of the flint-like rock encountered it will be sixty days before hydraulicking will begin. This property has yielded large returns in the past, although on account of its situation it could not be worked to a lower point than 15 ft. above bedrock. With the completion of the tunnel now in course of construction, the company will have an outlet so that it can wash the bottom strata which carries the bulk of the gold, as well as the coarsest.

SIERRA COUNTY.

A run of 1,500 lb. of ore from the Tightner mine at Alleghany recently resulted in $90,000 in gold, an average of $60 per pound. This mine was bonded not long ago to a San Francisco syndicate, but the corporation allowed its option to lapse, and the original owners have started working the property again with the above results. —— News of a rich gold strike on the top of Pilot Peak, one of the high natural landmarks of the Sierra Nevadas, has reached Gibsonville. The lode outcrops on the peak, and carries free gold and gold-bearing sulphurets. The claim is owned by Plumas Turner and brother, of Eclipse.

SISKIYOU COUNTY.

Henry E. Wood and H. V. Hodges, of Denver, have purchased a half interest in the Advance mine, near Etna. The price has not been made public. The last crushing of 180 tons averaged over $30 per ton. Returns from 50 lb. expressed to Denver of specimen ore brought in $60 per pound. There is over $200,000 in sight in the stopes, and the face of the lode is now seven feet wide, the ore from which in the last run went over $30 per ton.

TUOLUMNE COUNTY.

(Special Correspondence).—The Mt. Jefferson, situated in the township of Groveland, will probably be in operation again soon. The officers of the company are expected to arrive from the East shortly to inspect the property with a view to re-starting work. Should it be decided to resume operations, now that water is available, an air-compressor will be installed to run the mill and hoist.——The collar of the shaft of the Mazeppa mine, at which work was started up several days ago, has been repaired and unwatering will begin as soon as a pump is installed.——Owing to the fuel-oil supply giving out the Harvard mine has been temporarily closed down. The Jumper mill stamps have also stopped working for the same reason. It will be at least two weeks before fuel of the right description is available. ——Amended articles of incorporation of the Rawhide Gold Mining Company, filed in this county last week, show that in 1892 the capital stock was reduced from 100,000 shares to 15,000 shares at $1 each.——Lester R. Wiley, manager for the Big Creek Gold Mining Co., left this week for Bangor, Me., to attend a meeting of the stockholders. He will submit plans for at least one large electric power plant for construction on the Tuolumne river about nine miles from Groveland. Surveys for several sites have been made, one giving the water a vertical fall of 1,973 ft. It is estimated that 20,000 h.p. can be developed, which, according to present intentions, will be transmitted to coast cities. The company owns the Golden Rock ditch, which was recently re-constructed and which supplies the Groveland and Big Oak Flat sections.——E. P. Butts has been appointed superintendent of the Patterson mine, vice J G. Davies, resigned.——A five-stamp mill will be erected on the Ellen Winton mine, situated south of Tuolumne, the machinery for which has been purchased.

Tuolumne, Dec. 4.

COLORADO.

CLEAR CREEK COUNTY.

(Special Correspondence.)—The Linn Con. Co., operating the Mineral Chief and Smith & Wesson group on Democrat Mtn., has erected a small mill at the mine with a daily capacity of 10 tons. A wire-rope tramway 1,500 ft. long is being built to the valley below, to which a spur from the C. & S. R. R. can be run at low cost, reducing the expense of handling the concentrate to a minimum.——The Moline adit is being driven ahead and a raise will be put through to the adit above. The mine has steadily developed for the last three years, and large bodies of lead ore have been opened up in all the six adits. Should the present experimental mill prove efficient, the erection of a large mill at the foot of the mountain will follow.——In the Tobin mine of the Waldorf Co., 18 in. to two feet of lead-copper ore has been opened on the Independence lode, which assays $150 per ton. In the raise on this vein a fine body of lead-zinc ore is exposed. Improvement in the quality of ore in the Kitty Ousley mine of the same company is reported.—— The Griffith Mines Co. is now sinking the shaft from its lowest adit on a 30-in. vein of ore which assays $300 per ton; a small streak running through the lode assays 4½ oz. gold and 9,841 oz. silver per ton with 30% copper. The company's mill is nearing completion and should be running by the first of the year with a capacity of 50 tons daily. Large bodies of ore worth $20 per ton which have been standing untouched at the mine for many years will then be handled. W. A. Hoover, of Denver, is superintendent. ——H. Butts, manager for the Silver Plume Co. operating the Aspen Promise group on Leavenworth Mtn., reports that the ore in the main adit is becoming more solid. The lower adit will be driven ahead 200 ft. to catch this ore.

Georgetown, Nov. 30.

HINSDALE COUNTY.

The Hidden Treasure mine has again started operations, after several months shutdown, on account of the damage to their plant and property by the breaking of the Ute & Ulay dam.

SAN JUAN COUNTY.

(Special Correspondence).—C. W. MacArthur, who has constructed the Gold Prince mill, has finished his contract and left for Denver. This mill was expected to be in operation some time last December or January, but, on account of the railroad to Silverton being unable to move the material for the mill and the early snow, they were obliged to abandon work for the winter. According to Mr. MacArthur, the mill is now completed, awaiting power, which will be secured from the Animas Power Co., whose station is near Rockwood. Some time during September, a large amount of pipe of the power company was washed out and they have not entirely recovered from the damage done at that time. It is hoped within a few weeks to be in a position to furnish power as before. This mill will have a daily capacity of 500 tons and is considered one of the finest in this part of the State. The foundations are of concrete and the frame is made of steel. An aerial tramway connects the mine with the mill. The machinery was furnished by the Denver Engineering Works Co., of Denver. W. Z. Kinney, who has charge of the Gold King property, will also manage the Gold Prince.

Silverton, Nov. 21.

IDAHO.

SHOSHONE COUNTY.

The cross-cut from the shaft on the Douglas mine on Pine creek, south of Wardner, has broken into a solid body of sulphide ore of the same character as that opened for a length of 600 ft. in the upper tunnel. The control of the property is under bond to the Federal company, which has equipped the mine with machinery and is doing the present development work.——Control of the Idaho Giant property south of Mullan has been formally turned over to T. L. Greenough by D. K. McDonald, president of the company. The company is capitalized for 1,000,000 shares at $1 per share. The price paid was not less than 10 cents per share. The mine will be worked through the Central, a property recently purchased by Mr. Greenough for $30,000. ——Rich carbonate and crystalized lead has been found in the old shaft from No. 2 tunnel in the Idora mine, on Sunset peak. The Idora was examined by R. S. Marian of Wallace, who advised the unwatering of the old shaft, and this will be done.——J. F. Reddy has secured a $250,000 bond on the Amazon-Manhattan group of mines controlled by the Barry Hillard estate. His associates are M. J. Sweeney and H. R. Allen.——Control of the North Franklin mine, near Mullan, formerly owned by Joseph Peeper, president, Walter J. Bracking, and Norman Ebbley, was transferred to C. F. Booth, acting for a syndicate of Butte mining men. The basis of the sale was 25 cents per share.

NEVADA.

ESMERALDA COUNTY.

(Special Correspondence).—The visit of the Shriners recently and the special train of visitors from San Francisco yesterday have brought this camp closely into touch with the business of the Bay. About 70 San Franciscans came and were shown the bonanza wonders of the camp.

Freight shipments continue to be delayed, due, according to the railroads, to the lack of coal to operate trains. Side tracks are crowded all along the lines with freight for Goldfield, and there seems to be no immediate relief in sight. The volume of traffic headed this way warrants better service.

This week a special train arrived, running as No. 2 of the Overland Limited and carrying a 50-h.p. electric hoist and eight drills and compressor for the Loftus Davis lease on the Combination Fraction ground. The recent strike on this lease has developed into a big body of bonanza ore rich enough to warrant such an expenditure. This vein is a continuation of the famous orebody of the Hayes Monette and Francis Mohawk leases, on the Mohawk, and bids fair to equal it in spectacular values.

The Francis Mohawk lease is operating four shifts of six hours each at $5 per shift. Their lease expires the first of the year and every effort is being made to extract a full amount of ore. An illustration of their need of haste and the ineffectiveness of the railroad to meet conditions is the big dumps of ore this lease has accumulated, all of which will run into hundreds of dollars. Being unable to get cars, they pile up bonanza ore.

The consolidation of mines being engineered by Wingfield and Nixon is reported to have bought the Combination. This is one of the oldest and best equipped mines of the district and has paid regular dividends for several years. The reported price is $4,000,000.

The reports circulated in Eastern papers of the high death rate and the extreme difficulties of living in this camp are grossly exaggerated. The town is always crowded but new hotels are being rushed to completion and in the meantime every one finds accommodation somewhere.

A big rush of people and money into this camp is to be expected as soon as it becomes generally known that good ore is not confined to the Mohawk, and that one does not sign a death warrant by an entrance into this camp.

Goldfield, Dec. 3.

The official statement of the Mohawk properties, merged on November 20 as the Goldfield Consolidated Co., has been issued and shows that previous to the date mentioned the properties included in these interests produced a total income of $1,172,327. The average freight and treatment rate on ores shipped to smelters for the year has been $23.50 per ton with 97% extraction. Cost of treatment of oxidized ores in the Combination mill for the same period has been $5.82 per ton with 91% extraction. The prevailing country rock in the territory controlled by the company is dacite, an eruptive porphyry. In the Mohawk No. 2, bonanza ores have been found continuously from the south end-line northward for a distance of nearly 600 ft. along the claim. Deeper work in sinking the main Mohawk shaft during the past month and the Loftus-Davis shaft on the Combination Fraction have disclosed ore lying at a depth of 300 and 430 ft. respectively, showing no oxidation, and passing through a vein in the former case 35 ft. wide, assaying $50 per ton, and in the latter cutting a vein 10 ft. wide which gives returns of approximately $100 per ton. The ore in each instance is quartz heavily charged with sulphides of iron, copper, and bismuth. The Consolidated Co. secured an option on property of the Combination Mines Co., comprising 200 acres of valuable ground some weeks ago, and a deal was closed Dec. 1, by which the Combination properties are absorbed by the Consolidated, the consideration being stated at $4,000,000. This makes the fifth in the group which now consists of Mohawk, Red Top, Jumbo, Laguna, and Combination. The purchase has put an end to the danger of litigation, the apex of the Mohawk and Combination being in dispute.

Articles of incorporation of the Gold Mtn. Carbonate Co. have been filed at Carson with a capitalization of $1,500,000. J. E. Rickards, ex-Governor of Montana, is president of the new company, whose property consists of five claims, a townsite, and a water right in the Gold Mtn. district. There is a large body of ore on the property and assays have ranged from $26 to $82 per ton in gold and silver. The ore is free-milling. A portion of the claims will be leased to prospectors, while extensive development work will be pushed on the remainder.——A rich strike has been made recently on the Olga copper mine situated west of Mina. A large force of men is now at work uncovering an orebody that has assayed 41% copper in the bottom of the shaft. The mine is a short distance from the Sodaville-Tonopah and the Blue Light properties, the vein recently uncovered being an extension of the orebody of the Blue Light. A winze is to be sunk on the 60-ft. level of the Olga and driving started.——The Excelsior Mtn. Copper Co. is pushing work on its 14 claims situated 16 miles southeast of Hawthorne, and about 15 miles from Sodaville. Mineral indications extend for about 9,000 ft. along the strike of the contact, the company having sunk about a dozen pits all in ore. Assays of 18 samples give 8% copper, $8 in gold, and $6 in silver. Arrangements are being made in San Francisco for machinery, it being proposed to buy an air-compressor plant with eight drills. Work has been retarded owing to the scarcity of miners.

HUMBOLDT COUNTY.

There is a mining excitement 35 miles west of Humboldt and 30 miles from Mill City. About 250 people have

congregated and the townsite has been named Powhattan. The veins carry rich silver ore, in a porphyry. The most promising claim is in the Rosebud, on which about 30 ft. of sinking has been done.

LINCOLN COUNTY.

(Special Correspondence).—Col. C. A. Hopkins, of Boston, principal owner of the Quartette mine, returned from Los Angeles last week, where he obtained estimates for a cyanide plant to handle the tailing which has been accumulating at the mine for some years, and it is the intention of the owners to put in this plant at once, and also make other improvements. Recently, on the 800-ft. level they struck ore averaging $150 per ton.——The Barnwell and Searchlight branch of the Santa Fe railroad will soon be built into camp. It is believed that distillate, which is used extensively here for fuel and costs 16½c. per gal. laid down in Searchlight, can be procured when the road reaches here for 6½ cents; and timber which now costs $50 per thousand for at least $20 less. This means that thousands of tons of low-grade ore in the Quartette and other large mines running from $6 to $10 per ton and costing in the neighborhood of $6 per ton to mine and mill, with the advent of the railroad can be handled at a profit. The mines in operation at present are milling high-grade ore and a reduction of freight on lumber, fuel, machinery, and supplies will enable many properties with plenty of low-grade ore to run at a profit.——A. A. McKnight of the American Mines & Securities Co. who owns the Fortuna mine at El Dorado cañon, reports they have twenty-five tons of silver ore ready for shipment to the Selby smelter at San Francisco. The owners are considering two propositions in reference to handling their output, whether to install a mill or to build flat boats and transport the ore to the smelters at Needles on the Colorado river. The river is navigable between these points almost the entire year round. They have two shafts down 50 ft., assays running on an average of $150.——Charles Gracey, who has charge of the Morton property, has gone to Los Angeles to purchase a new equipment for the Tchaticup mine. The shaft is now down 600 ft. The plans of the owners include further sinking and driving. They are putting in a larger air-pipe and have new machinery ordered and already have a 25-stamp mill on the Colorado river about five miles distant.

Searchlight, Nov. 30.

NYE COUNTY.

(Special Correspondence).—The old Chispa mine, now known as the Congress, will soon be re-opened and Supt. Fairchild is now on the ground gathering men for a crew. The main shaft of this company is now down 350 ft. in good milling ore.——A syndicate of California bankers has purchased the Rainbow mines and a shaft will be sunk 1,000 ft. The Mae mine, the Boone mine, and the Boston Johnnie group have been purchased by a company that intends to organize a corporation for the purpose of development.——The Frost and Bowler leases were bought and will be consolidated in a leasing and milling corporation. The Johnnie Wonder Mining Co. has purchased the Iron King and Wonder Fraction claims. The working force on this property will be increased on the first of December.——The first carload of lumber for the new mill has just arrived and construction work will be commenced immediately.——Copper excitement continues and it was further stimulated by the discovery of chalcopyrite in the southwestern portion of the district by J. M. Todd. This prospector also opened up a vein continuing seams of chloride of silver and red oxide of copper.——Coe and Hastings, who have gone to the extreme southwest, have brought in good ore in porphyry. So far they are the first to report this eruptive rock in that part of the Jonnnie district. In the Johnnie Con., the drift from the 700-ft. level is being advanced in ore that averages $24. The drifts on the 500 and 600 levels are in good milling ore. The main shaft is being driven through a vein that opens occasionally to 15 ft. wide and averages $13.——In the Globe Johnnie the shaft is down 45 ft. in milling ore from the surface to the bottom. The lower tunnel has been forced through the step-fault recently and is now extended 110 ft. The west drift from the main shaft in the Bullfrog Johnnie is being worked in ore, some of which will bear the expense of shipping. On the Pittsburgh Johnnie a good orebody was opened up on the Lacelle claim.

Johnnie, Nov. 21.

(Special Correspondence.)—One of the newest mining flotations put out of Goldfield within the past month is that of the Keane Wonder Mining Co. of South Bullfrog. This company owns 22 claims on the Death Valley Slope of Funeral Range, 12 miles south of Rhyolite. Six or seven well-defined lodes traverse the company's holdings, and good values have been obtained from selected samples. One vein is in the neighborhood of 30 ft. wide, containing solid quartz with good walls, the vein averaging $18.10 per ton in gold. Three adits, one above the other, have been driven into the hill and the vein encountered, with the result that $650,000 of ore has been blocked out. A new adit has just been started at the base of the hill, which will tap the vein within a short distance, and give the company over 1,000 ft. of backs. A 20-stamp mill, with 1,200 lb. rapid drop stamps, is now under course of construction and will be in operation within 90 days. The mill is being furnished by the Risdon Iron Works of San Francisco, and will be complete in every detail, with facilities for concentration, amalgamation, and cyaniding. From tests made, 90% of the ore will be saved. A Riblet aerial tram will carry the ore from mine to mill, and within 90 days' time the Keane Wonder Mining Co. will have one of the best mine equipments in the State.

Goldfield, Dec. 1.

SOUTH DAKOTA.

CUSTER COUNTY.

(Special Correspondence).—The Southern Black Hills are enjoying a revival of mining activity and development work. The Granite Reef group, situated about two miles southeast from Custer, was sold last week to R. G. Galespie, of Pittsburg, Pa., for $20,000, a cash payment of $1,000 having been made, the balance payable in four months. The former owners were C. W. Robbins, Jas. Demerau, and A. T. Feay, all of Custer, the property consisting of ten full claims and two fractions. Mr. Galespie is owner of a number of wells in different oil districts, and has appointed Dan McGanagal as his local agent.——Mining for mica is on the increase in this county, and two sales of this description of property took place within the last fortnight, the Westinghouse E. & M. Co. being the purchaser in both instances. One of these mines, known as the White Spar, was owned by W. W. Olds, of Custer, while the other, situated about four miles west of the city, was the property of J. L. McKenna. Both were cash transactions, but the consideration has not been made public.——Among the varied mineral resources of Custer are veins of lithia-bearing ore, and two of these are being worked at the present time, R. Bond shipping ambligonite from his mine near this city on a contract at $25 per ton f. o. b. at Custer. Chas. Meigs, of New Jersey, is buying the material and sending it to his home town for treatment. The consumption of lithia is said to be largely on the increase in this and other countries, and its production bids fair to become one of the important industries of this county.——The Newark group of gold mines, numbering 21 claims, including the Turk group and a placer location of 80 acres, with water rights on French creek and Crow creek, are under bond to Eastern parties, who are expected to arrive and close the deal in a few days.

Custer, Nov. 27.

UTAH.

The Boston Consolidated Mining Co. has contracted with Fairbanks, Morse & Co. for the purchase of 312 Nissen stamps to be erected at their Garfield plant. Tests with the Nissen stamps showed a crushing capacity of 10¾ tons per stamp per 24 hours.

WASHINGTON.

OKANOGAN COUNTY.

Pay-ore has been found in the Capital mine near Twisp, where, in the long tunnel, a body of ore assaying $69.47 in gold has been opened. When the permanency of the ore-shoot has been demonstrated, a mill will be built. At the Red Shirt mine, an adjoining property, more than 3,000 ft. of work has been done. The owners are arranging for additional machinery.

Personal.

H. A. TITCOMB is at St. Petersburg.

GEORGE H. EVANS is examining mines in Nevada.

H. A. KELLER has returned to New York from Alaska.

ROSS E. BROWNE has returned from London to San Francisco.

WM. L. COBB has been examining mines at Rhyolite, Nevada.

G. A. DENNY, lately at Johannesburg, is visiting Denver and Leadville.

JOHN E. ROTHWELL, of Denver, is engaged in professional work in Mexico.

CARL HOFFMAN has returned to San Francisco from Guanajuato, Mexico.

FRANK H. PROBERT is examining mines in the Tonopah and Goldfield districts of Nevada.

HOWARD D. SMITH has returned from the examination of mines near Jefferson City, Nevada.

CYRUS ROBINSON is now consulting engineer to the Balbach Smelting & Refining Company.

FREDERICK A. GOWING has returned from Guadelupe y Calvo, Mexico, and is now at Oakland.

ALGERNON DEL MAR has been appointed mining engineer to the United Cobalt Exploration Company.

CHARLES J. EAMES, JR., is consulting engineer to the Boston-Mexican Mines Co., in Sonora, Mexico.

RICHARD B. STANFORD has resigned as manager of the Siempre Vivre Mining Co., at Bluefields, Nicaragua.

JOHN H. BANKS, of Ricketts & Banks, has been to Cobalt recently in connection with metallurgical problems.

JOHN HAYS HAMMOND and A. C. BEATTY have returned to New York from a visit of inspection at Cobalt, Ontario.

STANLY A. EASTON, manager of the Bunker Hill & Sullivan mines, has been visiting New York on his wedding trip.

C. H. SCHOEMAKER is assistant mining engineer to the Minas Tecolotes y Anexas, at Santa Barbara, Chihuahua, Mexico.

A. F. MAIN, assistant manager to El Oro Mining & Railway Co., has been examining the Rosario mine at Guadelupe y Calvo, Mexico.

JOSEPH GAZZAM, late manager of the Simmer & Jack, at Johannesburg, will be local manager for the Nevada Copper Con. Co., at Ely, Nevada. POPE YEATMAN will be general manager.

Trade Treatises.

THE INGERSOLL-RAND COMPANY, of New York, issues Catalogue X36, being a description of their Imperial Type Ten air-compressors.

THE COLORADO IRON WORKS CO., of Denver, issues Bulletin No. 21, entitled 'Screening and Sizing.' The Impact screen is described in detail, as well as other specialties, such as the Dorr classifier.

THE UNITED STATES DRYING ENGINEERING CO. has sent us their catalogue, containing a description of their automatic machinery for the utilization of by-products. The styles illustrated include direct, indirect, and steam-dryers, and an automatic digester for the conversion of garbage into fertilizing products.

THE B. F. STURTEVANT CO. issue Bulltin 134 of their Engineering series. It illustrates the type of blower manufactured by this firm originally designed for supplying air to cupolas and forges, and now adapted for all purposes where pressure up to 16 oz. per square inch is to be maintained, or where air is to be forced long distances. Methods and appliances for driving these blowers are appended.

Publications Received.

HARRON, RICKARD & MCCONE, of San Francisco, have issued a handsome book of views, illustrating the effect of the earthquake-fire, in the expectation within a few years of being able to issue another set of views illustrating wonderful progress in rebuilding.

ZEEHAN SCHOOL OF MINES. Annual Report, 1905. This comes to us from a useful institution on the west coast of Tasmania. It contains a general report on the doings of the School of Mines at Zeehan, a silver-lead district, and special articles on mining and smelting.

REPORT OF THE COMMISSION appointed to investigate the zinc resources of British Columbia and the conditions affecting their exploration. Mines Branch, Department of the Interior, Ottawa, Canada. This is a volume of 400 pages, handsomely illustrated, giving the results of a careful investigation made by Mr. Walter R. Ingalls, editor of *The Engineering & Mining Journal*, New York, and Mr. Philip Argall, mining engineer, Denver. The work was made by the Canadian Government at the instance of the Silver-Lead Association and Associated Boards of Trade of British Columbia. It is certainly one of the best government reports issued during recent years. There is a lot of valuable information on zinc treatment, with description of various machines, and a most excellent account, with detailed drawings, of the geology of the mines.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, December 6.

Argonaut	$4.70	Furnace Creek	$4.00
Con. Virginia	1.22	Savage	1.18
Mexican	0.97	Sierra Nevada	0.90
Ophir	2.85	Yellow Jacket	0.88
Belmont	6.25	Montana	3.80
Jim Butler	1.48	Mohawk	14.90
Jumbo	3.80	Red Top	3.80
Jumping Jack	0.52	Sandstorm	0.72
Manhattan Con	1.10	Silver Pick	1.75
Midway	2.50	Tonopah Ex	6.50

ANGLO-AMERICAN SHARES.

Cabled from London.

	November 28. £ s. d.	December 6. £ s. d.
Camp Bird	1 8 9	1 9 6
El Oro	1 7 6	1 7 6
Esperanza	2 18 9	2 14 6
Dolores	1 12 6	1 11 3 bid
Oroville Dredging	1 1 0	1 1 3
Stratton's Independence	0 3 3	0 3 6
Tomboy	1 12 0	1 12 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Average Prices for November.	Closing Prices December 6.
Copper—Lake (cents per lb)	22.388	22.70 @22.90
" Electrolytic "	21.828	22.10 @22.35
" Casting "	21.583	22
Lead "	5.75	5.75
Spelter "	6.378	6.45 @6.50
Silver (cents per oz.)	70.81	68⅜

CURB QUOTATIONS—NEW YORK.

	Closing Prices Nov. 22.	Dec. 6.
Bingham Central	2	1⅝
Boston Copper	30½	31
Calumet & Arizona	162	169
Cumberland Ely	12⅜	12⅜
Dolores	8⅝	8
El Rayo	7⅜	6⅛
Guanajuato Con	4¾	5
Giroux Con	11	10¼
Greene Con	26¼	26⅛
Nevada Con	19⅜	19
Nipissing	28½	17⅛
Tennessee Copper	47¾	48½
Tonopah Ex	6½	6⅛
Tonopah-Belmont	7¼	6⅜
Tonopah	20¼	20¾
United Copper	75½	73¾
Utah Copper	34	35¼

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE cost of candles in ordinary driving underground is about 25c. per linear foot.

AN UNDERGROUND TRACK should always be well graded and equipped with fish-plates. A bad track causes incessant delays, which result in high costs and small output.

WHERE heavy trains have to be taken round sharp curves, the track should always be watered behind the locomotive drivers. This will reduce the tractive force about 100% in some cases.

THE velocity of a stream may now be measured chemically. By the new method a certain quantity of brine is added to the water, and samples afterward taken at given points further down are analyzed.

SOMETIMES pieces of corundum and sapphires that are valueless as gem-stones, owing to their opacity and bad color, are coated with graphite and sold as carbons for diamond-drills. They accomplish a double fraud, being both heavier and less hard.

DITCHING can be done for 20c. per cu. yd. if a plow and scraper be used. If the soil be so rocky as to call for a pick and shovel, it will cost 40c. A fair price for a ditch 18 in. deep, 3 ft. wide at the bottom, and 4½ ft. wide at the top, is $3.65 per rod.

A CHARCOAL-IRON BLAST-FURNACE at Gladstone was recently placed in blast after having been banked for 17 months and 12 days. Following this suspension of over 17 months, the drafts were opened and the plant started without re-building the fires or removing the charge.

SLIME is not altogether a matter of extreme fineness, but the manner of its creation is also a factor, since aeration in process of crushing greatly increases the visual evidence of slime. For concentration, therefore, it is plain that aeration of pulp is not desirable.

A 10% SOLUTION of ferric chloride affords ready means for distinguishing calcite (calcium carbonate) from dolomite (magnesium carbonate). Immersed in this solution a piece of calcite soon becomes coated with a brownish deposit of hydrated ferric chloride. Dolomite does not give this reaction.

IN THE SELECTION of scrap tin for use in copper precipitation vats, care should be taken to avoid lacquered sheets, as they will only be attacked on the exposed edges, and thus their effective surface is much reduced. The use of scrap tin in preference to iron is a great economy; the product is of higher grade and the cost of handling is much less.

THE capacity of round or hexagonal revolving screens or trommels, running at 20 rev. per min. will screen approximately as follows per square foot of screen surface:

8-mesh screen,		100	lb. per hour.		
12	"	"	80	"	"
16	"	"	65	"	"
20	"	"	50	"	"

POWER generated from electricity is usually sold to the metal mines of the West at from 5 to 8 dollars per horsepower per month according to the locality, the distance of transmission, and the quantity bought. The old contracts still fix the price by the horse-power per month, the consumer paying for a specified amount, whether consumed or not. In the new contracts, it is usual to sell by the kilo-watt hour.

AT Iron Mountain, Mich., at the Hamilton Iron mine a suppposedly perpendicular diamond-drill hole 600 ft. deep was bored. Later, a perpendicular shaft was sunk so as to include the drill-hole at the southwest corner at the surface. By the time the shaft had been sunk 400 ft. that particular hole had moved over and disappeared under the north set, to come back again into the shaft, to again disappear in the northeast corner, and, from then on, it was never known what had become of it.

THE capacity of a set of rolls depends largely on its evenness of surface. If the rolls are worn so as to become corrugated, and so that they do not meet except in spots, their efficiency is reduced, often as much as 50%. A set of well constructed 14 by 27 in. rolls, with even surfaces, and running at 100 rev. (700 ft. peripheral speed) per min., and taking ordinary quartz ore from the crusher at 0.5 in. size; will reduce it approximately as follows:

To pass	8-mesh	screen			3,500	to	4,000	lb.	per hr.
"	"	12	"	"	2,500	"	3,000	"	"
"	"	15	"	"	2,000	"	2,500	"	"
"	"	20	"	"	1,500	"	1,800	"	"

ON THE MOTHER LODE, California, the cost of sinking and timbering the ordinary three-compartment shaft averages between $30 and $50 per foot. The Gwin shaft to a depth of 1,800 ft. cost about $40 and the Oneida to the same depth cost $67 per foot with hand-drilling and under exceptional difficulties. The following were the costs per foot for machine-drilling at the Centre Star mine at Rossland, B. C.:

	Sinking main shaft.	Sinking small shaft.	Raising.	Driving.
Compressed air	$3.48	$3.26	$3.07	$1.35
Drill fittings	1.46	1.53	1.83	0.65
Labor	24.70	20.13	16.77	7.25

CHARCOAL is today manufactured in retorts so that the by-products of the wood may also be recovered. The smoke from such retorts is drawn through extensive coils of copper piping surrounded by cold water and forming an immense condenser. By this process the smoke is chilled and reduced to the liquid state carrying a heavy, coffee-colored sediment. The liquid is then put through various processes by which the solids are separated from the fluids and various by-products secured. A cord of maple wood weighing 3,500 lb., will yield 880 lb. or 44 bushels of a dense charcoal, 8 gal. wood tar; 4¼ gal. wood alcohol, 208 gal. pyroligneous acid and 64 lb. acetate of lime. The charcoal is used in the blast-furnace work, the acetate of lime in the manufacture of smokeless powder.

THE rocks of the Manhattan district, in Nevada, range in geological age from Algonkian through Cambrian to, probably, Silurian; the eruptives that penetrate them are Tertiary and the gold itself was introduced in, geologically speaking, recent time. There are placers in the soil and surface wash at Manhattan (derived from the rain-erosion and weathering of the veins) in which the gold is ragged and angular—not the least water-worn. "It has all its arms and legs," as the miners say. These placer deposits overlie washed gravels deposited by the post-Neocene erosion of the region; so late has been the introduction of the gold in the veins that primitive man may have been building his fires when the fern-like crystals of gold were forming at Manhattan and Round Mountain.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Prospecting Dredging Ground.

The Editor:

Sir—In your issue of November 3, Mr. D'Arcy Weatherbe attacks the drill method of prospecting dredging properties on two grounds, namely:

1st. That it is not so reliable as shaft-sinking.

2nd. That it costs more.

Allow me to take exception to these statements. They are not borne out by the experience of men who have tried both methods. I believe we might modestly claim the credit of having, about ten years ago, introduced the present generally followed plan of testing or exploring prospective dredging ground by means of the drill. At that time I was called to Boston to consult with Mr. Charles E. Souther, president of the New England Dredging Co. about a prospect he was trying to make near Boise City, Idaho. He was attempting to do it by shafting and, after spending a small fortune and about a year's time, he had failed to get a single shaft to bedrock. He had been driven out by the water. If I remember correctly, he had sunk two or three shafts in close proximity, using the pump in one to lower the water in the other, but still failed. The inflow of the water carried with it the sand, and even if he had gotten the cribbing to bedrock he would have been wholly uncertain how much of the material excavated belonged to the area of the shaft. We furnished him a machine and in about one month his operator reported having sunk "seventeen holes to bedrock in twenty-four days." Mr. Souther was so well pleased with the results that he enclosed us a check for the price of the machine and ordered a second one shipped to Yreka, California. The machine was sent and its operation introduced to the attention of dredge-men at Oroville. There are now at Oroville more successful dredges than in any other like area in America, and we believe that the ground being worked has in every case been reliably and, as results of dredging show, successfully prospected by duplicates of the original drill furnished to Mr. Souther. If there has ever been a failure of a dredge, which followed prospects accurately made by the drill, we have not heard of it and we are in pretty close touch with every dredging field in the world.

It is practically impossible to sink a shaft, by the China method or any other, through boulders and quicksand, and take out an exact area. The inevitable influx of silt and sand from the surrounding embankment may completely vitiate the test. On the contrary, if carefully done the 7½-in. hardened steel drive-shoe usually cuts an exact area from top to bottom, and the contents of this test-tube may be taken up with exactness and certainty. Of course, some allowance must be made when the ground is entirely composed of large boulders, but even here the chances are in favor of the drill, for it will break a round hole right through them. The presence of water, quicksand, flowing silt, etc., offers no resistance whatsoever, but may and does require a little different method of handling the drill and driving the test-tube.

The question which Mr. Weatherbe raises was brought out and conclusively settled eight or nine years ago at Oroville, by a system of experiments. Drill-holes were first sunk and the values obtained were carefully computed; then, without removing the test-tube, a shaft was sunk around it to bedrock and the values from it likewise accurately computed. The two sets of values were then compared and my informant stated that the value per surface area of the *shaft* was somewhat the larger, but the dredge afterward proved that the value determined by the drill was nearer correct.

As to the difference in cost of prospecting by these two methods, the question is perhaps an open one. No general conclusion, that will absolutely apply to all localities is possible. Shallow tests in dry clayey ground might in some instances be made by shafts at a lower cost. But in frozen ground, such as is found in Alaska and Siberia, or in submerged quicksand such as is liable to occur anywhere, the cost by the drill method has been proved by hundreds of experiments to be far lower. On one occasion, in Oregon, with the assistance of two men, in a quicksand swamp where water stood within 12 inches of the surface, the writer sunk holes 88 to 91 ft. deep at the rate of one in 16 hours. In average ground it is common to make a 35 to 40 ft. test in 10 to 12 hours with a crew of three men.

But first cost is of little significance. *Accuracy* is the thing that counts. And without going further than the complete and invariable success of the operations at Oroville, the verdict is for the drill method.

R. M. DOWNIE,
Keystone Driller Company.

Beaver Falls, Pa., November 12.

Gold Dredging.

The Editor:

Sir—Referring to Mr. D'Arcy Weatherbe's valuable contribution in your issue of November 3, I may state that the season for dredging in New Zealand has been unfavorable, especially on the Molyneux river and its tributaries. The river has successively fallen and risen in such a way as to cause suspension of work on the dredges in the gorges and a hampering by drift and silt on the others. The season is almost over and only a few days of actual operation have been possible so far this year. Outside of the gorge dredges, there are between 40 and 50 machines at work in Ontago with a total output of about 1,000 oz. of gold per week.

TRAVELER.

San Francisco, November 7.

Treatment of Copper Ore.

The Editor:

Sir—I am inclined to disagree with an item under the heading of 'Concentrates' in your issue of November 10. A process is described in which copper carbonate ore is treated at the Snowstorm Co.'s mill at Larson, Idaho, by subjecting the crushed ore to the action of a 10% solution of sulphuric acid and a solution of chloride of lime; it is inferred that the latter is added with a view to converting any silver contained in the ore into chloride, thus forming a ready means of separation between insoluble silver chloride and soluble copper sulphate. Now, while chloride of lime would certainly serve this purpose, it is hardly likely that it is added with this end only in view, for a solution of common salt would answer equally well and not only is the latter much cheaper than chloride of lime, but weight for weight it contains considerably more chlorine and therefore a given quantity is capable of converting more silver into chloride than the same quantity of chloride of lime. Without knowing the nature of the ore it is only possible to hazard an opinion, but I am inclined to think that the chloride of lime solution is added with the object of attacking small quantities of copper sulphide or native metal which may be contained in the ore. The chloride of lime coming in contact with the sulphuric acid would give off nascent chlorine which would be capable of attacking both native copper or copper sulphide, while sulphuric acid and salt,

unaccompanied by an oxidizing agent, would have comparatively little action upon either.

It may be that the silver in the ore is in such a state of combination, that while it is not attacked by sulphuric acid, the thiosulphate solution, used to leach the residue insoluble in sulphuric acid, would have no action upon it either. In this case the chloride of lime solution would be used to convert the silver into a form in which it is readily attacked by thiosulphate of soda solutions.

F. H. MASON.

Johnsville, Cal., November 16.

Milling Gold Ores.

The Editor:

Sir—There has been an interesting discussion lately in your journal in relation to 'The Position of Plates in a Mill,' and now comes an article in your last issue by Mr. Algernon Del Mar on 'Milling Gold Ores.' Such discussions are instructive and interesting to me, for they call to mind personal experiences occurring during many years of mining and milling. Being a millman of some experience, I can fully appreciate the article on 'Milling Gold Ores,' yet it appears to be a pretty large dose for the ordinary layman to digest. The article is as full of meat as an egg, and seems to be quite a treatise in a condensed form. Not being in love with inside amalgation, I do not agree with the writer that "once caught inside the mortar, the gold is as good as coin," because very often the night millman goes to sleep, or there is a sudden change in the richness of the feed, and under such circumstances the amalgam on the inside plates gets too hard and is scoured off, or gets too soft and is sloughed off. The millman knows nothing about it till he examines his outside plates, and how long some plates go without being examined, only the Lord and the millman know; consequently, some of it is lost, for, as your contributor says, "scoured amalgam is difficult to catch on outside plates." I have often seen a thick coating of amalgam on a chuck-block that we were taking so much pains and pride to build up, as only a millman can realize, change color from a silvery white to rusty red or black; then, of course, no further amalgam could be looked for on that plate, and the only thing to do was to change plates in order to save the amalgam.

Mr. Del Mar gives the general impression in his article that inside amalgamation should be commended, and then cites his own experience as otherwise: For instance, he says, "With an ore in Nevada, a 50-mesh screen (which is conducive to inside amalgamation) gave $12 to $15 tailing, while a 30-mesh screen (which is less conducive to inside amalgamation) gave only $6 to $8 tailing," and he adds that this experience was rather puzzling. I think he has given a good reason for it, and about the only real one, when he says, "Extreme comminution causes flouring of both gold and mercury, which are then most difficult to catch. Extreme comminution would take place with the 50-mesh rather than the 30-mesh screen. Again: "In an experiment with a roller mill crushing dry, mixing with water and running over copper plates, less than 30% of the gold content was caught, while the same ore, after being reduced in a five-stamp battery over the same plates, has yielded over 80%." This experiment shows that dry-crushing allowed the gold content to become foul with air and dirt, which would prevent amalgamation; on the other hand, wet-crushing, which presumably was the case in the five-stamp battery, would protect the gold from being fouled until it came in contact with the mercury. We all know, or ought to, that when mercury is 'floured' or subdivided it is likely to become 'sickened,' that is, coated with a film of air or dirt, so that no amount of agitation will force the globules of mercury to come together again till it has been thoroughly cleaned. Until then it is of no use as far as catching gold is concerned. The same process applies to gold; it can be crushed so small as to become floured and fouled, and then it is indeed a fight between the millman and the tailing sampler. Quite a number of mills along the Mother Lode of California have in the last few years lowered the discharge, and are using coarser screens, thereby doubling the output in some cases, in the same mill, without a corresponding increase in the value of the tailing.

It does not take much to foul both gold and mercury. Let me cite a personal experience. Some years ago I was sent to South America to take charge of a 20-stamp mill. The mortars were deep and roomy; they contained a back inside plate and a plate on the chuck-block. The outside plates were not silvered, they were the width of the mortars and eight feet long, no other plates or concentrators were used, except a few feet of plate in a launder at the lower end of the mill that apparently were forgotten. The head millman was a white man who was not from California, his help consisted of two or three natives, and the method of saving gold was to soften the plates every morning with mercury rubbed on with the bare hands. The amalgam was left on the plates from one clean-up to another, which was at the end of every month. Sulphides would foul the plates badly, and they were rubbed off with the bare hands about every three hours, with the stamps still dropping and the pulp and water running over the plates. The average saving was 35 per cent. It is needless to say that the natives were at once taught a different method. The discharge was lowered, the inside plates were taken out, as the ore was very low-grade, the screen was changed from 40 to 30-mesh brass wire, the plates were treated in California style, and the value saved was at once raised to 75 per cent. No matter how clean the hands, if they are rubbed hard on the outside of a screen while the mill is running a blotch will appear that looks like grease and for a few seconds will actually prevent the pulp from coming through that part of the screen—if the hands will do that to a screen you can imagine the effect on a sensitive plate.

At another mill in Costa Rica run entirely by natives, I saw them dressing the plates by pouring on mercury by the bottle-full; rubbing it off at the lower end with their hands, and catching the surplus in a launder. I heard afterward that this mine did not pay, but have no doubt that the creek below the mill would pay well. To summarize, every mill as well as every mine, is a problem by itself, and when the right kind of a mill is installed it requires constant attention on the part of the millman to prevent loss of gold. When the millman has time to read newspapers and novels, as some do, then he is in the wrong position. When I visit a mill and hear nuts and washers jingling around the battery-frame, I know that the millman needs 'jacking-up' or sent to the office, for he is not in the right position. He should always be where he can detect the slightest change in the sound of the stamps, see that the screens are discharging freely, the plates in proper condition, etc. His position is just as important as the grade and position of the plates. He should not only be a mechanic and machinist but a metallurgist to the extent of knowing the nature and affinities of gold, silver, copper, mercury, cyanide of potassium, and the different acids. And when the millman puts in 12 hours in a 40-stamp mill or even a small rattle-trap, and does his duty, the nervous strain is almost too much and he should receive better pay than he usually does, for he is the man who can save or lose more money for a company than any other.

H. P. GORDON.

East Oakland, November 24.

West Australian Gold Mining Costs.

Specially contributed to the MINING AND SCIENTIFIC PRESS.

[We owe this valuable paper to the courtesy of the engineers in charge of the important gold mines managed by Bewick, Moreing & Co., in Western Australia. Our thanks are specially due to Mr. H. C. Hoover. The managers of the mines in question are: H. E. Vail, at the Lake View Consols; R. B. Nicolson, at the Ivanhoe; D. P. Mitchell, at the Oroya-Brownhill; John McDermott, at the Sons of Gwalia; J. Allen, at the East Murchison; Gerard Lovell, at the Great Fingall; and C. Hope Nicolson, at the Cosmopolitan.—Editor.]

It is of some interest to have a generalized figure as to working costs in a given region. In South Africa and West Australia the mines are operated in 'groups' under one central head, which results in a similarity of accounts, and in most cases the expenditures are set out fully in annual publications and present an opportunity for collective comparison. The method of combining the costs of a number of mines into one cost sheet, as if it were one mine, is of course open to much objection from the standpoint of detail, yet a generalized figure may be of some interest to your readers, and though the data were prepared for other purposes, they may be worth publication. Seven mines have been chosen from the group of 18 associated with Messrs. Bewick, Moreing & Co., and they were chosen as being representative of the variable conditions of the larger mines as to size, transport character of ore, etc. The mines selected are:

Name.	Stamps.	Locality.	Distance by rail from coast, miles.
Lake View Consols	70	Kalgoorlie	390
Ivanhoe	100	"	390
Oroya-Brownhill	50	"	390
Sons of Gwalia	50	Mt. Leonora	490
Cosmopolitan Proprietary	50	Kookynie	460
Great Fingall	100	Day Dawn	400
East Murchison United	40	Lawlers	580*

*In this case it is 490 by rail and 90 miles by wagon-road from the coast.

In dealing with such deposits the difference of economic surroundings in mines a few miles separated, the variability in the size of orebodies in even adjoining mines, or the character of ore and its consequent treatment, lend justifiable cause for wide fluctuation in costs from one mine to another, even in the same district. The Oroya-Brownhill presents one extreme, in that it has the most difficult and complex of telluride ores, and the Cosmopolitan another, having clean quartz easily amenable to amalgamation and concentration with cyanidation of sand, slime, and concentrate. This group of mines employed 420 stamps during 1905, and milled 944,736 tons of ore.

METHOD OF ACCOUNTS.—The expenditures in various departments are split up into Labor & Salaries, Stores, Power, Assaying & Sampling, and Repairs & Maintenance. Obviously, the last three items are composed also of Labor and Stores, and they are first segregated separately and then spread over the various departments, the power according to steam consumed; the Assaying & Sampling as to the origin of the sample; the Repairs & Maintenance according to the locality of the work required.

In dissecting the expenditure, it was found that of the total expenditure 45% was for wages and salaries, 38% for stores, and 17% for sundries, such as insurance, taxes, shipment, and refining of bullion, etc.

Labor.—There were worked upon these mines 678,025 shifts (a maximum of 8 hours), showing the average cost per shift to be 15s. 5.51d. Of the total of £524,085. 3. 9 thus expended upon labor, the various departments bear the following ratio:

	Per cent.
Development	24.21
Ore extraction	46.63
Ore treatment	23.03
General expenses	6.13
Total	100.00

Stores.—The following table shows the percentage of each to the whole. The total expenditure on stores was £438,121. 6. 5.

Description.	Per cent.
Explosives	11.82
Fuel	29.69
Steel	1.03
Candles	1.63
Timber	4.38
Cyanide and bromo cyanide	13.15
Quicksilver	1.25
Mill spares	4.32
Sundries	3.50
Other supplies	27.34
*Water	1.89
Total	100.00

*This refers to water purchased only, not to water procured by the companies' own plants; nor does it include cost of distillation, all of which are included under Power.

Power.—In power generation 160,974 tons of wood and coal were consumed, and 44,669,167 gal. make-up water were used, 103,263,127 gal. water consumed in condenser cooling, and 13,632 gal. lubricating oil employed. The total amount of steam generated was 1,344,988,900 lb. The efficiency of engines varies greatly, from the triple-expansion condensing engine at 14 lb. per h.p. hr. to the sump-pump at the tailing dam, consuming 60 lb. The total expenditure debited to this department was £185,940. 1. 9, or equal to 3s. 11.27d. per ton of ore treated.

Assaying & Sampling. — The total number of assays made was 188,529; the total expenditure was £12,923. 9. 7, or 1s. 4.45d. per assay. There were 143,286 samples taken underground, at a cost of £5,966. 1. 1, or 10d. per sample.

Repairs & Maintenance.—The total expenditure under this head was £120,562. 6. 0, or a cost per ton of 2s. 6.63d., divided as follows:

	Per cent.
Labor	55.55
Supplies	42.19
Power	1.33
Sundries	0.93
Total	100.00

As depreciation is not taken into account in this statement, it may be well to note that all construction, except actual extensions, is charged under the above head, and it is expected that for the major part, plants are preserved in the original state of efficiency. As depreciation is really a factor of the life of the mine, and this is unknown, it is the practice in these companies to write off the original construction on their balance sheets, the same year it was installed, so that the plants are not carried as an asset at all. If it be assumed that the life is 12½ years, then the depreciation would be about 8% per annum, or in this case roughly two shillings per ton of ore treated.

EXPENDITURE ON DEPARTMENTAL BASIS. — The organization of any mine may be considered as a chain made up of many links of variable lengths, each representing a special operation. The number of links and the length of the link varies with each mine. To attempt to compare in detail results in even a group which, as the above, is under practically the same administration, would be sufficient warning to all those who love to contrast results upon one mine or another. I believe it to be quite impossible to assign any particular relative value to such links, nor is it possible to assess a value to the causes which create variation in the costs of the same links in various mines.

From the standpoint of costs, the number of links is not so important as the stress that may be laid upon a

particular link. For instance, the Oroya-Brownhill grinds all sand to slime, in order to obtain perfect extraction, while on the Ivanhoe, with an ore of only one-half the value, such a course is not economically advisable, and the latter mine profits in costs by the cheaper method of percolation instead of grinding and filter-pressing the whole product. Such differences might be pointed out with regard to every mine, but to describe all those differences would run into a volume of itself and obscure the main objective which is to indicate a sort of mean average of costs.

The links in the chain of operations on these mines are divided as follows, for purposes of this article:

1. DEVELOPMENT:
   - *a.* Shaft sinking.
   - *b.* Driving.
   - *c.* Cross-cutting.
   - *d.* Rising.
   - *e.* Winzing.
   - *f.* Diamond-drilling.
2. ORE EXTRACTION:
   - *a.* Breaking ore.
   - *b.* Supporting stopes.
   - *c.* Haulage to surface.
3. TREATMENT:
   - *a.* Rock-breaking.
   - *b.* Transport to mill.
   - *c.* Stamp-milling.
   - *d.* Concentrating.
   - *e.* Treatment of concentrate.
   - *f.* Fine grinding of sand.
   - *g.* Cyanide treatment of sand.
   - *h.* Cyanide treatment of slime.
   - *i.* Disposal of residue.
   - *j.* Precipitation and smelting.
4. ADMINISTRATION:
5. REALIZATION OF BULLION:

DEVELOPMENT.—A total of 48,102 ft. of openings were made, omitting plat-cutting and diamond-drilling. The ore in these mines occurs as orebodies or ore-shoots in quartz lodes, and involves not only a large amount of dead work to reach the ore, but a large amount of purely prospecting work in search of new ore. That this is no inconsiderable item can be surmised from the fact that less than 40% of the total footage done was actually in ore. How far this enters into the question of development costs, as compared to mines with continuity of ore, even much narrower reefs, is indicated by the fact that nine Rand Mine, Ltd., 'subsidiaries' are given in 1905 as having done 50,823 ft. development work, resulting in the exposure of 2,599,000 tons ore, or about 51.1 tons per foot, as against an average of 22 tons in this West Australian group; in other words, the narrow reefs of the Rand require less than one-half the amount of development work in order to secure the same tonnage.

The following table gives the details of expenditure, contract work being accounted for as if it were on day's pay:

TABLE I. DEVELOPMENT.

	Shaft-sinking. Cost per ft.			Driving. Cost per ft.			Cross-cutting. Cost per ft.			Rising. Cost per ft.			Winzing. Cost per ft.			Diamond-drilling.* Cost per ft.		Average cost per foot of all work except diamond-drilling. 48,102 ft.			Cost per ton. 944,736 tons.	
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	s.	d.	£	s.	d.	s.	d.
Labor	15	17	4.78	2	1	11.40	1	14	10.80	2	8	1.90	3	16	2.46	5	2.55	2	9	9.61	2	6.43
Explosives	1	4	11.93		10	8.62		9	11.89		8	7.25		11	4.71				10	5.26		6.38
Timber	3	3	5.72			4.97			0.56			9.12		1	0.03				1	7.60		1.00
Candles		5	6.21			9.69			7.82			11.19		1	6.33		0.10			11.31		0.57
Steel		2	2.58			6.41			4.26			7.38			9.86					6.89		0.35
Sundries		18	5.96		3	1.78		2	8.22		3	6.15		4	3.58	3	4.69		3	9.75		2.33
Power	2	14	4.76		10	10.59		8	11.85		11	0.39		15	9.70		7.40		11	8.31		7.14
Assaying and sampling		1	1.07		1	10.33		2	0.25		1	8.03		2	0.62		2.89		1	10.61		1.15
Repairs	2	2	3.81		5	1.74		4	3.23		6	0.05		7	8.23		0.14		6	0.05		3.67
Pumping	2	13	11.60		2	9.49		1	1.16		4	0.30			11.10		0.04		3	4.20		2.05
Total	29	3	10.12	3	18	3.02	3	5	0.04	4	5	3.76	6	1	8.62	9	5.81	4	10	1.59	4	7.07

* Cost, but not footage, included in totals.

The total sum of £217,519. 17. 2 was expended upon development. In the system of accounts followed an amount equal to the cost of stoping the tonnage of actual ore broken in the course of development is deducted from the development charge and added to ore extraction, the remainder being considered *pro tem.* a capital outlay, and is written off either by way of redemption or by direct depreciation in the balance sheet. The net amount charged to Development Account was £199,489. 5. 7, or equal to 4s. 2.67d. per ton, on the 944,736 tons milled during the year. There was, however, actually developed during the year a total of 1,057,751 tons, so that the real cost of development would be, if redemption were done, 3s. 9.26d. per ton, and this figure is used in final summary.

ORE EXTRACTION.—The average stoping width is between seven and eight feet. The length of continuous runs of ore is usually not long, but this is a matter affecting development more largely than actual ore-breaking. A large proportion of the ore is broken with machine-drills. Under colonial law, all stopes must be supported, and as the cost of timber for this purpose is prohibitive, recourse to some method of filling is universally resorted to. The angle of dip varies considerably, and in three mines of the group it is too flat for the ore to 'run,' and must be shoveled from the stopes. The total expenditure on this account, including ore from development, was £390,107. 5. 9.

The following table indicates the costs:

TABLE II. ORE EXTRACTION.

	Breaking ore. Cost per ton.	Filling stopes. Cost per ton.	Haulage. Cost per ton.	Total cost per ton.
	s. d.	d.	s. d.	s. d.
Labor and salaries	3 3.57	6.38	1 4.38	5 2.33
Explosives	7.58	0.02		7.60
Timber	2.36	0.25		2.61
Candles	0.85	0.19	0.34	1.38
Steel	0.46			0.46
Sundries	1.56	0.19	0.56	2.31
Power	6.28	0.11	4.61	11.00
Assaying and sampling	1.91			1.91
Repairs, maintenance	3.72	0.13	1.77	5.62
Pumping	3.25	0.22	0.57	4.04
General expenses	0.07	0.01	0.04	0.12
Total	5 7.61	7.50	2 0.27	8 3.38

TREATMENT.—The basis of treatment is stamp-milling, concentration, and the leaching of various products by cyanide. With this statement similarity ends, as a different amount of fine grinding, percolation, and sliming results on each mine. The costs of treatment on the different mines varies from 8 to 16 shillings, the higher costs being due to special treatment demanded by the

occurrence of rich tellurides in some of the mines. The following table shows the cost in some detail, upon the mill tonnage, and the supplementary tables show the cost of special operations on the tonnage actually handled in these operations:

TABLE III. ORE TREATMENT.—TONS.

	Rock breaking.	Transport to mill.....	Milling	Concentrating ...	Treatment of concentrates	Fine grinding sands.	Cyaniding by percolation	Cyaniding by agitation	Filter-pressing ..	Precipitation and smelting .	Disposal of residues ..	Total cost per ton ...
	d.	d.	s. d.	d.	d.	d.	d.	s. d.	d.	d.	d.	s. d.
Labor and salaries	1.20	1.80	6.00	1.56	2.14	1.20	2.76	1.20	4.20	0.96	5.04	2 4.06
Power	1.68	0.36	1 0.00	1.32	1.06	3.60	0.84	1.32	2.28	0.01	0.60	2 1.07
Repairs and maintenance	1.44	0.48	6.12	1.20	0.83	1.68	0.84	0.48	1.20	0.24	0.84	1 3.35
Assaying and sampling			0.24	0.12	0.30	0.01	0.36	0.24	0.24	0.23	0.12	1.86
Water			0.72	0.24	0.10	0.11	0.12	0.60	0.01	0.01		1.91
Fuel					0.80					0.24		1.04
Lime			0.01		0.04		0.48	0.36	0.12			1.01
Cyanides					1.04		3.60	6.12	0.47			11.23
Bromo-cyanide								7.80				7.80
Quicksilver			0.35		0.10							0.45
Sulphuric acid								0.48		0.48		0.96
Filter-cloth					0.02				0.60			0.62
Zinc										0.96		0.96
Shoes and dies			1.68									1.68
Royalty								2.88				2.88
Sundries	0.24	0.12	2.28	0.12	0.41	1.20	0.36	0.12	0.48	0.71	0.36	6.40
Total	4.56	2.76	2 5.40	4.56	6.84	7.80	9.36	1 9.60	9.60	3.84	6.96	8 11.28

TABLE IV. DETAILS OF CONCENTRATE TREATMENT.
Cost per ton on tonnage treated.

	Roasting.	Cyaniding.	Fine grinding.	Total.
	s. d.	s. d.	s. d.	s. d.
Labor	3 6.00	1 2.87	1 1.00	5 9.87
Power	1 0.62	5.99	1 4.00	2 10.61
Repairs	1 2.70	2.78	8.50	2 1.98
Assaying	2.11	2.90	0.56	5.57
Water	0.95	2.18	1.05	4.18
Quicksilver			1.69	1.69
Fuel	2 1.00			2 1.00
Cyanides		2 10.00		2 10.00
Lime		0.94		0.94
Filter-cloth		0.58		0.58
Sundries	3.77	2.21	3.72	9.70
Total	8 5.15	5 6.45	3 8.52	17 8.12

TABLE V. DETAILS OF CYANIDE TREATMENT.
Cost per ton treated.

	Fine grinding sands...	Cyaniding sands	Cyaniding agitation...	Slimes filter-pressing	Total .....
	s. d.	s. d.	s. d.	s. d.	s. d.
Labor	2.86	5.90	3.29	10.73	1 10.78
Power	8.44	1.84	3.71	5.47	1 7.46
Repairs	4.14	1.83	1.38	2.83	10.18
Assaying	0.07	0.72	0.68	0.44	1.91
Water	0.53	0.30	1.41	0.04	2.28
Cyanide		7.59	1 5.91	1.37	2 2.87
Bromo-cyanide			1 11.44		1 11.44
Royalty			8.36		8.36
Lime		0.97	0.89	0.22	2.08
Filter-cloth				1.70	1.70
Sundries	2.93	0.85	0.41	1.09	5.28
Sulphuric acid			1.18		1.18
General expenses		0.02			0.02
Total	1 6.97	1 8.02	5 2.66	1 11.89	10 5.54

ADMINISTRATION & GENERAL.—These items include Superintendence, Taxes (except duty on dividends), Rents, and charges generally not allocatable to special departments. They do not include London Expenses.

The total of these charges was $75,320. 8. 11, or 1s. 7.13d. per ton, of which £24,678. 5. 0 was for shipment and refining of bullion. This latter item on many mines outside of this group does not appear in cost sheets, this expense being deducted from the value of the bullion by the purchaser, the mine taking into account only the realized value.

SUMMARY.—The summary of the various items works out as follows:

	Per ton. s. d.	Percentage of total.
Development	4 2.67	18.33
Ore extraction	8 3.38	35.95
Treatment	8 11.28	38.80
General expenses	1 0.86	4.65
Realization of bullion	0 6.27	2.27
Total	23 0.46	100.00

Hydraulic Mining in Colorado.

Written for the MINING AND SCIENTIFIC PRESS
By W. E. THORNE,

In this article I will endeavor to give some of the actual costs in this class of mining in Colorado, as conducted at a high altitude and during short seasons of from four to five months; under these conditions the matter of fixed charges becomes an important factor. The deposits are of glacial origin, most of them being lateral moraines, and as a result the material is not well rounded and does not wash through the sluices as easily as stream gravel. It is also of the heaviest specific gravity, making the duty of a miner's inch low, with a minimum grade of three inches to 12 ft. Most of our work so far has been by way of development. In our operations the duty of a miner's inch has been from 0.25 to 0.73 cu. yd. per 24 hours. This is about one-half the usual figure. In opening up this property it was necessary to drive a tunnel about 500 ft. long and raise through a shaft to open out a pit in order to get working room. The cost of this tunnel per linear foot was:

Labor, blacksmith, superintendent, etc	$ 9.825
Square sets	0.275
Lagging	0.880
Sluice lumber	0.533
Six-inch blocks for riffles	0.540
Powder	0.246
Total	$12.299

The size of the tunnel inside of timbers was 6 ft. at top, 7 ft. at bottom, and 7 ft. in the clear. The average per 24 hours (consisting of three 8-hour shifts—$3 per shift per man, $4 per shift for foremen) was 15.47 ft. working from four faces. The cost was high on account of very tight cemented gravel. Our sluices were double through this tunnel, 3 ft. wide in the clear, 3 ft. deep, bottoms of 1½-in. lumber, sides of 1¼-in. lumber. In laying a quantity of large slip-joint pipe on this property, the cost per foot was as follows:

Labor	$0.0416
Cost of ties for pipe	0.0075
Cost of clearing right of way	0.0150
Hauling by team	00.050
Total cost per foot	$0.0691

The report for one month's work shows that it cost 38.7 cents per cubic yard to handle the material, including all expenses. This was due to the fact that we had not opened our pit in good shape for economic operations, and 10% of the boulders were too large for sluicing. The next month's operations show a cost of 26.6c. per cu. yd., or a reduction of 12.64c. per yard, as compared to the previous month. The following month was 23.5c., or a further reduction of 2.56c. per yard. In the fourth month the costs were 21.13c. per cu. yd. This shows a reduc-

tion again of 2.37c.; the boulders too large for sluicing were less than 4% of the material handled. Our best showing in the matter of costs was 11.25 cents. This low figure was only reached during a time when we had a maximum head of water and with conditions favorable as to character of gravel. In some places there are reefs of boulders of large size, and as we are working at right angles to the lateral moraines, when we strike one of these reefs it reduces our capacity and increases our costs to over three times what it should be. In explanation of this working at right angles to the lateral moraines, I may state that they are deposited parallel with the hill, and in order to get grade for our sluices and dump-room for the tailing, it is necessary for us to cross these moraines, at right angles instead of following them.

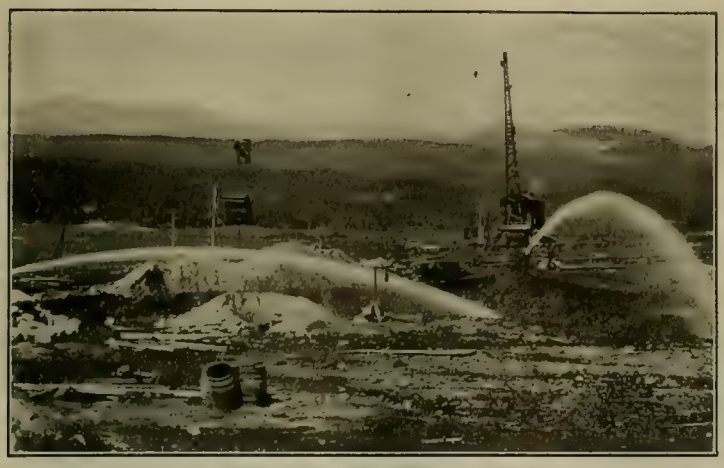


Fig. 1. An Improvised Cable-way.

On this property we found an American Hoist & Derrick Co.'s locomotive crane, 8 ft. gauge with 45 ft. boom, having a radius of 50 ft.; maximum lift, 50 ft., capacity, two tons. This had been used on a track in the pit, but it always gave trouble on account of the water splashing from giants and throwing sand on the friction brake; as a result the brake would not hold; there was also excessive cost for building track. This scheme for handling boulders was abandoned. The crane was changed by making a gravity cable-hoist of it for one season. We placed the boom vertical and with guy ropes to hold it. We used a 26-ft. post at one end of the cable, and by having a difference in elevation of some 15 ft. between the tail-post and the crane we were enabled, with 300 ft. of cable, to use this as a gravity cable-way, as shown in Fig. 1. A skeleton carrier was designed with 4-ft. wheel-base with trigger arrangement, so that by striking a block on the cable the stone-boats were discharged automatically. The next season, having moved up the gulch some distance, where the difference in elevation between a head and tail tower was very slight, we did not have room for a gravity hoist. In consequence, we built two 30-ft. towers, one at the crane and one for the tail. We took off the boom, swing-gearing and traction-gear of the crane, using one for out-haul cable and one for return cable, which enabled us to utilize this crane as a cable-hoist and keep it out of the pit altogether. We installed a five-ton crab for moving the crane, in place of the traction-gear, and it all works very successfully. The towers are about 300 ft. apart. Instead of using this cable-way with a standing cable, it was arranged with double block at the head-tower from the main drum, so that the whole cable-way and carrier lowers into a pit where the boat is loaded, hooked onto the carrier, the standing cable is drawn tight, the out-haul cable started, running the carrier out where a plunger on the carrier strikes a bumper that is clamped on the main cable and automatically dumps the boat. Then the boat is returned to the pit. This arrangement (by actual test) has a capacity of over 300 loads, of 1½ tons each, in 10 hours, making the capacity ample for all purposes.

Fig. 2 shows the double line of sluices just below where they leave the tunnel, it also shows a number of different sluices that we are compelled to use on account of shallow dump-ground. Alongside the sluices can be seen two under-currents that are in operation, each 6 ft. wide by 12 ft. long with ¾-in. drop per foot. These under-currents are covered with cocoa matting and then 2-in. angle-iron riffles are used; these have proved effective in saving fine gold, and from the test on the tailing we find that our losses are so small that commercially they do not count.

For this season's work we tested our gravel with the ordinary churn-drill, using a Loomis Machine Co. Clipper No. 2 with 6-in. casing. In this work we found that in our clean-up it yielded a saving of a little over 31% in our sluices above what our drill-test showed.

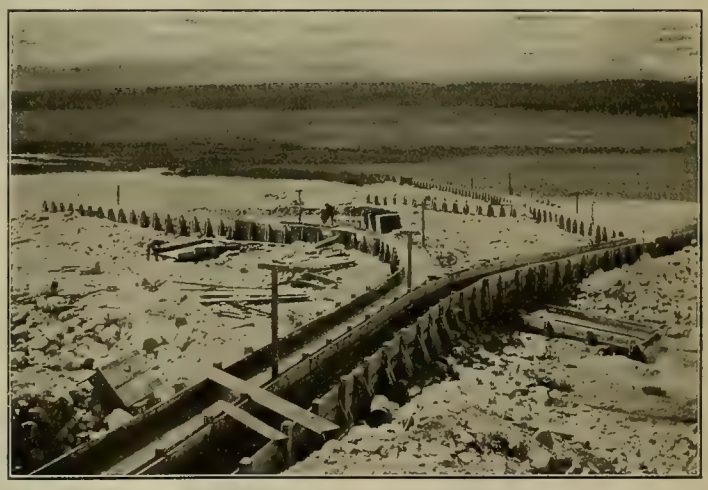


Fig. 2. Double Lines of Sluices.

This is something a little unusual in testing gravel by the churn-drill method. In this test we averaged about six holes per acre. The work was carefully done, as the drillman had instructions to not lead his casing with his bit.

The panner also had instructions to not amalgamate his gold and to not save the very fine flour gold. This accounts for the better saving in the sluices than the average return from drilling. Cost per foot of drill-hole, $1.95. Cost per cubic yard of gravel developed by drill, two-tenths of a cent.

Asbestos.

*The name asbestos (from the Greek signifying 'inquenchable'), as commercially used at present, covers at least two distinct minerals, having in common only a fibrous structure, and more or less fire-and-acid-proof qualities.

These are:

1. Amphibole or hornblende asbestos (actinolite).
2. Serpentine asbestos (chrysotile).

In external appearance and in chemical composition they are much alike, so much so, that, when the crystals occur in long slender prisms or in radiating masses, the mineral is called actinolite; but, when found in long slender flexible fibres, easily separable, it is named asbestos. The difference between the two minerals—between good and bad asbestos—will be at once perceived when the fibres, or long slender crystals, are subjected to tearing, twisting, or bending between the fingers. The good asbestos, applicable to the finer purposes of manufacture, will give up fine silky threads of great elasticity, amenable to the various spinning processes; while bad asbestos will split up into harsh, sometimes brittle, fibres, occasionally breaking up when rubbed between the fingers. The heat-resisting properties of both these varieties are approximately the same, so that, when this characteristic of asbestos is the only quality desired, the amphibole variety will give as good satisfaction as the chrysotile; but, whatever strength of fibre, as well as non-conductivity of heat is desired, the chrysotile variety is the only one that can be used satisfactorily. Chemically, the two species are much alike. Chrysotile asbestos is a hydrous silicate of magnesia, while the amphibole varieties are silicates of lime and magnesia, or compounds of silica with an earthy base, part of them hydrated. A special feature to be noted is that none of the varieties low in chemically combined water have much of the unctious feel which is so common a characteristic of the chrysotile varieties.

Chrysotile is the fibrous form of serpentine, and occurs in this rock in small veins, laces, or stringers. Its main essentials, to render it of economic value, are length, fineness and elasticity of fibre, tensile strength, flexibility, and power of fire-resistance. The Canadian chrysotile possesses all these qualities, the length of fibre being the principal factor which determines the grade. The main difference between asbestos and any other substance is its finely fibrous structure, and, at the same time, its property of fire-resistance. It may be said that, upon these two qualities, the great value of asbestos is generally based. Temperatures of 2,000 to 3,000° F. are easily withstood, while, with some varieties, a temperature of 5,000° F. has apparently produced no effect. Its property also of successfully resisting the action of acids is one of great value, and these combined qualities render asbestos of great importance in certain chemical operations, so much so that its use in laboratories and chemical factories is largely increasing. Chrysotile has great adaptability for spinning. For a long time the fibre, unlike any other, resisted attempts in this direction, the difficulty arising from the peculiar formation of the fibres, which, possessing perfectly smooth surfaces, slipped past one another when subjected to the spinning process. But all these difficulties have been overcome, and a single thread of fair tensile strength can now be made weighing not more than an ounce per 100 yards.

The hardness of Canadian chrysotile is from 3 to 3.5 Mohn's scale, and its specific gravity is 2.2 to 2.3. It has a lustre sub-resinous to greasy, pearly, wavy, and silky. The color in mass is generally dark-green to blackish green. In most cases the fibre, when drawn out in threads, is white with a silky lustre. The fibre in nature is found arranged in parallel layers, and vertically to the bordering planes, is easily separable, and has a length from a fraction of an inch to several inches; the fibre of the great bulk of the mineral is, however, half an inch and less in length. As already indicated, chrysotile is a hydrous silicate of the following composition:

	Italian.	Canadian.
	%	%
Silica	40.30	40.87
Magnesia	43.37	41.50
Ferrous oxide	0.87	2.41
Alumina	2.27	3.67
Water	13.72	13.55

Chemical analysis indicates the cause of harshness of the fibre of some asbestos. The water in asbestos is combined, and may be driven off at a sufficiently high temperature. Where harsh asbestos is analyzed we find it to contain less water than the soft silky fibre. It is well known that, if soft fibre be heated to a temperature that will drive off a portion of the combined water, there results a substance so brittle that it may be crumbled between the thumb and the finger. There is evidently some connection between the consistency of fibre and the amount of water in its composition. It is probable that the harsh fibre was, as originally deposited, soft and flexible, and has been rendered harsh by having a portion of its combined water driven off by the heat, either produced by the movement of the associated rocks, or resulting from the injection of molten matter through volcanic action.

*Abstracted by L. S. AUSTIN from 'Asbestos, Its Occurrence, Exploitation, and Uses,' by FRITZ CIRKEL, Mines Branch, Department of Interior, Canada.

MEXICAN BELLS. — A bell of modern design is to be substituted for the old veteran which has called the faithful to prayer for the last three centuries in the church of San Juan at Aguas Calientes. *The Mexican Herald* says that since it has been decided to sell the old relic, which was set to swinging in the first church erected there after the conquest of the country by Cortez, a number of borings have been made into the bell to determine its worth. These show that it is very rich in both silver and gold, and its value has been conservatively placed at $2,000. The weight of the bell is almost a ton, and as the assays show that it contains nearly 2% silver it holds $800 worth of the white metal alone.

The date of the casting of the bell is shown to have been 1624, which shows how long it has been in service. At that time little or no attempt was made by workers in metals to extract gold and silver from copper ores. The precious metals were produced from the mines which carried lead as well, and as a consequence was much easier smelted. Copper ores were reduced in a crude way, and the gold and silver, if they were recognized, were allowed to remain. On account of the high values of silver and gold which the old bell has been found to carry, it is believed that large amounts of the precious metals were placed in the melting pot by church devotees, who at that time believed it a pious thing to do so. Silver was known to improve the tone of bells, and the gold may have been added as a kind of sacrifice, old records showing that in some cases the priests of that day induced the richer classes to give up their golden ornaments for that purpose.

The finding out of the worth of this bell is likely to have a far-reaching effect in the other churches here, as it is believed that all of the copper bells in this city are just as valuable as the one which has just been sold. The congregations of the other churches are ready to take the matter up.

ONE of the greatest of national assets is scientific discovery.

Other Metallurgical Methods at Pachuca.

Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

Pachuca affords examples of other methods besides the ancient *patio*. Some of these I shall describe :

The Hacienda La Union offers much that is interesting to the metallurgist. The process is that of Kroeneke, used in Chile, but modified by the manager, Francisco Narvaez, formerly a captain of artillery and graduate of the military engineering school of Chapultepec. As a military officer he visited the United States three years ago, and, becoming much interested in metallurgical practice, he resigned from the service to undertake the work for which he has since shown so much aptitude.

The scheme of milling involves first a Sturtevant roll-crusher, which reduces the ore from 3 or 4 in. to ⅝-in. diam. An Imperial shaking-screen sizes the material to 16-mesh ; the undersize is fed into an Abbé tube-mill of 5-ft. diam. and 22 ft. long, while the oversize passes through rolls, without springs, with 14 by 27 in. faces (made by the Denver Engineering Works). The amount of iron that gets into the pulp is only 2% ; this fact is important in view of the chemical treatment that follows. Capt. Narvaez was led to adopt this method by reading Richards' 'Ore Dressing.'

Later on, without stopping the regular operation of the mill, he intends to replace the barrel amalgamation process by cyanidation; as far as grinding is concerned, his results indicate that Chilean mills will more than hold their own against the competition of newer devices for pulverization. They permit of a very fine grinding at a low cost per ton. From an average of thirty sizing tests, made on the product of the Chilean mill at this *hacienda*, Capt. Narvaez obtained the following results :

	Percentage.	Assay in silver gram	Percentage of assay-value retained.
Finer than 200 mesh	80	1	93.65
Between 200 and 150 mesh	4.75		0.27
" 150 " 100 "	13.45	385	0.47
" 100 " 80 "	1.50	355	0.48
" 80 " 60 "	0.41	346	0.01

The original assay of the ore gave 1,102 grams per metric ton. One of these mills, for example, worked from February to June without stopping once for repairs ; and with the ordinary unskilled labor, it ground 15 to 18 tons per 24 hours from 1½-in. size to the fineness recorded in the tests just quoted. The cost per ton did not exceed one *peso*, or less than 50 cents per ton.

At the time of my visit there was one Krupp tube-mill, with other foundations ready for the Abbé tube. The Krupp tube crushed 50 tons to 100-mesh in 24 hours. It was preceded by a Krupp ball-mill, which reduced the ore from 1½-in. size to 24-mesh. It is necessary to grind dry, on account of the barrel process, which constitutes the main feature of the treatment. With the use of Chilean mills, as at the time of my visit, it was necessary to dry the product. Both ball-mill and tube work dry. Silex linings in the tube last three years. The use of the Chilean mills yields iron which becomes oxidized by the water, while the iron, worn away from the balls in dry crushing through the Krupp mill, is in a metallic condition and in an amount suited to the later chemical reactions in the barrel. The ball-mill is charged with four balls of 8 kilo. each per day, this representing the iron abraded from the balls themselves and the lining also. For setting the silex lining in the tube, a common cement with two parts of sand is used; it sets in three days. Trouble has been made by the fact that some of the sectional pieces of lining are not cut to the right curve; but only three dropped out after being in use for a month. The flint pebbles are bought from Indians, who will not divulge the locality whence they bring them. They are paid 35 *pesos* per ton, while the imported pebbles cost 75 to 90 *pesos* per ton. The tube has no screen, the material passes through the length of it and is then discharged.



An Old-Fashioned Chilean Mill.

In the new plant as it will be re-arranged, the Krupp ball-mill will deliver its product to the Abbé tube, for re-grinding, and both will work wet, instead of dry. The ore that goes to the Chilean mills will be crushed to 1½-in size in a breaker and from the Chilean machines the pulp will be pumped direct to the vats and cyanided. From the day in January that E. M. Hamilton, associated with Charles Butters, made a cyanide test on the ore at this *hacienda*, Capt. Narvaez has made more than 200 tests,

obtaining an extraction of 98.12% on the silver and 88.4% on the gold. He believes that extraction of the gold is less than that of the silver because the gold is encased in the pyrite and, to liberate it, re-grinding is imperative. But the ore contains only 5 grams gold per ton, therefore it remains yet to be proved, by further experiment, whether it will be necessary to re-grind more than 20% of the ore.

It was the custom formerly to use the *camonero* to move the product of the Chilean mills into the *patio* where it was allowed to dry in the sun, but the change to dry crushing will obviate the necessity for this practice. At the time of my visit the Chilean mills were being operated without screens, the discharge being by overflow, thus saving labor while using a great deal of water, of which there was plenty. The tires on the Chilean mills are changed so as to equalize the wear; they last two years; the dies last only about eighteen months. Each mill requires 10 h.p. The Fraser & Chalmers, or Union, type of Chilean mill, modeled after Walker's patent, gives good service, grinding 15 tons per day; those of other makers treat only 8 or 9 tons, because the runners do not maintain a vertical attitude. Seven Chilean mills ground 60 to 70 tons per day, while the Krupp ball-mill crushed 50 tons per day of 24 hours.

The product from the grinding machinery goes to the barrel room. There are 13 barrels originally made by Allis-Chalmers and since modified on the spot. Each barrel is beneath a hopper that holds a charge of 4.7 tons. As this is filled by the cars (each carrying half a ton) a grab sample is taken to determine the percentage of moisture and the richness in silver; from the aggregate of all these samples a mean of the iron assay is obtained for the week, so as to indicate if the amount be sufficient to effect precipitation; if not, zinc is added to help precipitation and because it has been observed that the gold recovery is better when zinc is employed in addition to the iron. The cuprous chloride is proportioned to the amount of silver amalgam in the barrel, decreasing from, say, 60% Cu_2Cl_2 at the beginning of the month to 22 or 24% at the end. The silver in the charge is precipitated on iron. The barrel treatment consumes eight hours; it requires four hours to charge and re-charge. Mercury is added half an hour after the treatment has begun. Salt is added in the ratio of 27 kilo. of salt per ton of ore; no more copper sulphate is added than that required when making the copper chloride solution. The loss of mercury per month is 800 grams per kilo. of silver; the loss of silver is 6.88 to 9% when treating three charges per day.

The barrels are washed out once per month, during the remainder of the time the silver amalgam accumulates inside of them; it is taken out every other day, in such an amount as to yield 250 to 300 kilo. of silver bars.

From the barrels the pulp goes to six washers or agitators, and from them to *apuros* (or wells) underneath, where the silver amalgam is secured. Thence the tailing passes outdoors to a crude form of conical buddle. The 2,300 to 2,500 tons of tailing per month contain 110 to 120 g. silver per ton and yield 25 to 30 tons of concentrate assaying 2 to 3 kilo. silver and 30 to 40 g. gold per ton.

When Cu_2Cl_2 is added, there is a formation of AgCl and sometimes of HgCl; then if zinc (in the form of strips of metal, not shaving) is added, the metallic silver is precipitated and also the mercury. Sodium hyposulphite was tried, but, although useful, it was not found necessary. The purpose of it was to regenerate the Hg from the HgCl formed, and the same end could be gained by the motion of the pulp in the barrel—a motion resembling the manual operation termed *refregar* or rubbing by the *peones*. If there is enough iron in the pulp, it will precipitate the silver, but the amount of iron is not under control, hence the addition of zinc if the iron be inadequate. From the wear of the lining and of the balls in the Krupp mill, Capt. Narvaez was getting 600 g. iron per ton of ore, this being the amount which practice has demonstrated to be necessary. Whenever, for any reason, the amount is less than that specified, zinc is added. Experience has proved that, although 1,200 g. iron is adequate to precipitate the silver in a charge of two tons of ore and give bullion 999 fine, yet zinc is always needed in order to increase the gold recovery. If this be done, the bullion will assay 960 g. silver and 2.8 g. gold per kilo., while, if the zinc be omitted, the gold will not exceed one gram per kilogram.

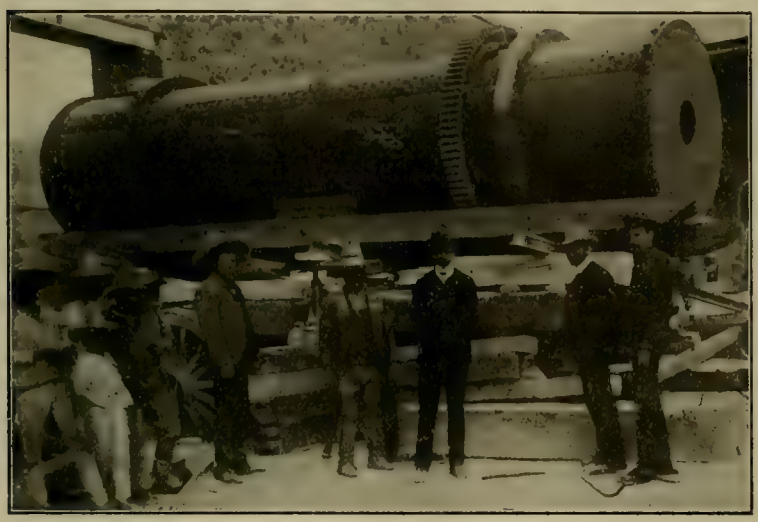
The total extraction of silver by this barrel process is 95%; that of the gold from 35 to 75%. In the concentrate, 5% more of the gold is saved. The gold is to the silver in the ore in the ratio of 5 to 1,000. The ore treated at the mill is worth as delivered 23 to 25 *pesos* per ton, the cost of extraction (*maguila*) last year was 10.50 per ton, and the profit 8 *pesos* per ton. The ore assays generally 1.2 kilo. silver, equal to about 41 *pesos* per ton.

The bulk of the ore obtained from the mines of the Real del Monte Co. is similar to that treated at the Hacienda La Union, although in the Corteza mine of that company there is produced the class of manganese ore called *quemazones* on account of its black appearance. Such ore is not suitable for the process of amalgamation because of the loss of mercury, following upon the familiar reaction in which a mixture of salt, manganese dioxide, and sulphuric acid evolves the chlorine destructive to mercury. At the time of my visit, this ore from the Corteza mine went to the Hacienda de Loreto; it was a black silicious material containing 8% manganese dioxide. The treatment to be described has ceased lately, the mill having been utilized to test the adaptability of the cyanide process to this class of ore. At first the idea was to erect a ball-mill, followed by a re-grinding tube, as at La Union, but later it was decided to install two sets of rolls, of the same dimensions and running at the same speed, the first pair for reducing the ore from 3 to ¾ in. and the other for grinding to 16-mesh; between the rolls there is a trommel, and thence the material goes to the tube-mill. Trouble was caused by the moisture in the ore, a coating being formed on the silex, requiring removal with a chisel.

I shall now describe the process for which the original plant was built; it was a modification of the Francke process, originally developed in Chile. On arrival, the ore passes through a Blake crusher and then it is fed to the rolls, which delivers it to a trommel provided with a 70-mesh screen; the undersize goes to the bins, while the oversize passes to a tube-mill (*cilindro remoledor*), also made by Krupp, where it is re-ground with flints (*piedras de chispa*) at the rate of about 40 tons per day. Then it joins the previous undersize in the bins. Next come four calcining furnaces, each with a capacity of 20 to 30 tons per day. The charge of 10 tons is given 1½ hours. Salt is added in the proportion of 18 kilo. per ton of ore. The calcined product drops below the furnace and is taken in wheelbarrows to the cooling floor. Here it is shoveled into vats (*tinas de Bolivia*) where it becomes mixed, through the agency of revolving arms, with cupric chloride ($CuCl_2$) and mercury. Copper plates placed along the sides of the vats catch any gold in the pulp. Each vat is 3 metres deep and 2½ m. diam. During the treatment steam enters through the bottom. Three charges of nine tons each are treated per day. Then, after four hours of mixing, the pulp is discharged from these vats, through three openings at successive

levels leading into pipes which empty in a mercury trap (*apuro*) outside. Here the silver amalgam is caught. The tailing passes on to two settlers, without further addition of mercury, the purpose being to arrest any amalgam escaping from the preceding operation. Below each settler there is an *apuro*, which finishes the treatment.

Only one shift of 12 hours (by day) is employed. Two men work at each furnace; these also do the wheelbarrow work. The pans occupy three men; in addition, there are two roustabouts and one foreman. Each charge is



An Abbe Tube-mill, Just Arrived.

not followed by a clean-up; the amalgam is allowed to accumulate.

The mill was idle at the time of my visit; it is probable that there was a heavy loss of mineral which was ground fine in the tube and then pulled by the strong draft into the chimney of the calcining furnace. Also there is likely to have been loss of silver by volatilization as chloride.

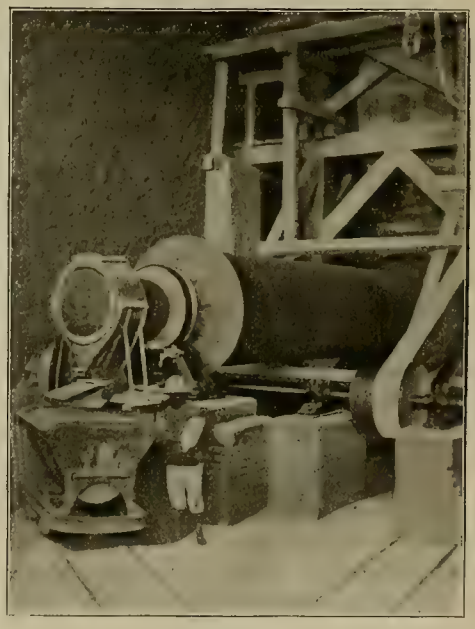
The machinery is operated by electricity and in contrast to this flagrant modernism is the shrine in the roaster house, with its picture of the Virgin. In other parts of the establishment there are crosses, decorated by withered flowers. Everywhere in the *hacienda* there is an exuberance of masonry; the works are enclosed by massive walls, like the ramparts of a fortress of the old-fashioned kind.

Such ore as does not contain manganese oxide, and comes from the other mines operated by the Real del Monte Company, undergoes direct concentration followed by amalgamation. This quartz ore is reduced by two Blake crushers and then passes to 14 Chilean mills, which discharge through 80-mesh screens. The feeding is done by automatic (the Hendy Challenge) machines. From the Chilean mills the pulp goes to 32 Johnston vanners, which extract the pyrite, not only to get at the gold that is intimately associated with this pyrite, and to take out half the silver in the ore, but also with a view to simplifying the *patio* process that follows and which would otherwise need the addition of more chemicals. The 14 Chilean mills grind 800 to 900 tons per week; the crude ore contains 1 kilo. silver to 5 or 6 g. gold; the pyritic concentrate represents 4 to 4½% of the crude ore; the richer concentrate, with 9 to 10 kilo. silver and its proportionate amount of gold, is shipped to Germany, while the poorer, with 4 to 6 kilo. silver, is sent to the smelters at Monterey and Aguascalientes.

The tailing from the vanners goes to big ponds, where it settles to a thickness of 8 to 9 in. of pulp. The *camonero*, or horse with the drag, is employed to move the slime to the different rectangles in which the mixing stage of the *patio* is carried out. There are seventeen rectangles (50 metres wide and 80 m. long), for the treatment of as many charges or *tortas*, each being equal to 220 to 300 tons. The mixing is done, not in the old way by horses, but with a mechanical harrow, such as has been described in connection with the Hacienda Guadalupe. In this case also, it seemed to me that the mechanical mixer failed in its service, the material was too wet, the harrow omitted to turn the pulp over and simply passed through it, without overturning it so as to cause aeration. Moreover, as the harrow cannot be made to scrape the floor, there always remains at the very bottom an inch or more of pulp that is not moved and which, therefore, escapes metallurgical treatment. The clean-up was done as at the Hacienda Guadalupe, so that the description need not be repeated.

The retorting is worth noting. The bricks of amalgam are built up in a pyramid of about one ton weight standing in an iron pan, the bottom of which is perforated. A hood is then dropped over it; a flue from the furnace enters through an aperture near the base of the hood. The mercury, as it is distilled, passes out at the bottom into a stream of cold water by which it is condensed. The ratio of mercury to silver in the amalgam is as 8 to 1.

At the Progreso mill, which was built by that representative American millman, M. P. Boss, there are 50



A Krupp Tube-Mill.

stamps, followed by four Kinkead mills; the latter is a machine for re-grinding. Then come two chemical mixers, 16 pans and four settlers, followed by four New Standard and six Johnston concentrators. Just outside

the mill I saw the old-time Mexican method of concentration by the *planilla*, or little plane. The material is heaped up at the head of an inclined plane, 8 to 10 ft. long, 4 to 4½ ft. wide; the operator throws the water with a horn, by successive regular sweeps of his arm; at intervals he scoops up the material with a wooden shovel, and as the heading becomes cleaned (or concentrated), he moves fresh material to the top of the incline. Mexicans can be seen operating the *planilla* in the streams that receive the tailing from the mills at Pachaca and Guanajuato. The process resembles 'trunking,' or the treatment of slime from the tin-dressing floors in Cornwall.

A Department of Mines.

At the Trans-Mississippi Congress, in session at Kansas City on November 22, Mr. Victor C. Alderson, president of the Colorado School af Mines, spoke on the need of a Department of Mines and Mining, with a cabinet officer at the head of it. Mr. Alderson said in part:

The mining industry is basal. A department would crystalize and bring into harmony all the various influences to upbild and dignify the industry. Today the miner gets the title to his claim from the land office, more or less untrustworthy. His maps are too late for his use; his information is too old. Prompt advice, assistance, co-operation, is not for him. A department could remedy this state of affairs. In the second place it would revise our mining laws and eliminate much of the legal stupidity in laws made by men who know nothing of the industry. There should be a recognition of mining commensurate with its importance. In the third place it could conduct researches such as are carried on for the benefit of the agricultural industry. Today there is no place where we may turn for information or advice. Such research would open new avenues of prosperity, reveal fresh opportunities for the investment of capital, and provide work for tens of thousands more men. Such a department would secure the enactment of new laws. It is not a work for mere politicians, nor for any particular State, but from the standpoint of national development. The duty of the Government is to foster research and to give dignity and standing to the industry.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rocks from Ures, Mexico, marked W. L., are highly silicious metamorphic rocks, apparently baked shales and quartzite.

The quartz and silicious limestone from Ogden, Utah, marked L. F. H., can be used for glass-making, although the limestone may be too refractory.

The specimens from Table Rock, Cal., marked J. J. G., are: No. 1, Rhyolite tuff; No. 2, Hornblende Porphyrite; No. 3, Hornblende Porphyrite or Andesite; No. 4, Rhyolite; No. 5, Porphyrite.

The specimens from Eagle, Alaska, marked C. A. B., are: No. 1 to 5, Quartzite and quartz rocks containing granular pyrite. Some of the pyrite has oxidized to dark brown limonite. No. 6 is Dolomite.

The specimens from Belgrade, Montana, marked H. M., are: No. 1, altered Quartz-mica rock filled with pyrite. No. 2, Quartz with pyrite oxidized to limonite. No. 3, Calcite and yellow clay. No. 4, banded Quartz and chlorite.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The statutes of Missouri require the owner, agents, or operators of any mine to keep on hand a sufficient supply of timber to be used as props, and that when a miner requests the use of props in the mine they shall be sent to him without unnecessary delay. This statute is not limited in its application to miners at work for wages, but extends as well to those mining coal at a fixed price per bushel.

McKinnon *v.* Western Coal & Min. Co., (Mo.) 96 S. W. 485.

A statute, providing that the owners or operators of a mine should keep on hand props for use in the mine when requested, was held to mean that the props must be promptly furnished when requested by a miner; but that it did not impose upon the owner or operator of the mine the duty of knowing when such props were needed and supply them without being requested. The word "required" was construed to mean "requested," and that the meaning of the statute is that when a miner makes the request the mine owner or operator shall be in a position to furnish the props or send them into the mine without delay.

McKinnon *v.* Western Coal & Min. Co., (Mo.) 96 S. W. 485.

The statutes of Tennessee regulating the operation of mines and requiring the employment of what is termed a "certificated mine foreman," and conferring on such foreman control of the mine with reference to the duties specified in such statutes and secured the faithful discharge of such duties by the imposition of penalties. In an action by a miner against the owner of a mine for injuries caused by the negligence of such foreman as provided for by the statute, the Court held that the mine owner was not liable for the negligence of such statutory foreman in the performance of the duties imposed upon him by the statute.

Sale Creek Coal &c. Co. *v.* Priddy, 96 S. W. 610.

The lessor of premises to another for the purpose of exploring for oil and gas by drilling a well cannot recover damages for the lessee's failure to drill the well, without showing that oil and gas existed in the territory to be developed.

Duff *v.* Bailey, (Ky.) 96 S. W. 577.

The United States statutes, providing for the issuance of patents for mineral lands and the prosecution of adverse claims to mining locations, apply only to adverse claims arising out of independent, conflicting locations of the same ground, and not to controversies between co-owners claiming under the same location. And an owner of an interest in a mining claim, who has been excluded by his co-owner from an application for a patent, may adverse or protest such application and maintain an action in support thereof, under the statutes which permits an action for possession of an interest in realty to be brought by a tenant in common against his co-tenant, where the law has actually ousted the former, or where he has done some act or acts amounting to denial of the former's right as a co-tenant.

Davidson *v.* Fraser, (Colo.) 86 Pac. 694.

The record of a notice of location of a lode claim, as required by United States statute, is only effective to prove the bare fact of the record of such notice; this record is not evidence that the notice was posted on the claim, or that the location was so marked on the ground that its boundaries could be readily traced, that they included the apex of a lode, the existence of any valuable mineral in place, or that the necessary assessment work had been done; proof of all these facts are essential to the validity of the location, in addition to the introduction in evidence of the record of the notice. A notice of location of a lode claim which fails to contain a description of the claim by reference to a natural object or permanent monument by which it could be identified, as required by the United States statute, is ineffective for any purpose.

Mutchmor *v.* McCarthy, 87 Pac. 85.

The Old Way and the New.

Written for the MINING AND SCIENTIFIC PRESS
By FRANK DRAKE.

In the year 1864 some prospectors invaded the deserts of the Great Basin and staked out a few mining claims on the western slope of the White mountains in Inyo county, California. The Government had not yet enacted any laws governing the occupation of mineral land. The first claims were limited to the small areas prescribed by the custom and laws of the miners of the Pacific Coast at the time. When the Congressional act granting miners' rights and defining the size of claims went into effect, they or their successors re-located their claims, and a large area was covered by their holdings. The workings were tentative, only sufficient to hold the titles. Practically all real development was on the claim now known as the Southern Belle.

A description of the early operation and of the present condition of the mines will present many interesting features.

Several veins, chiefly quartz carrying free gold, traverse a formation consisting of schist and shale, locally termed slates. To open what at the time was supposed to be the main vein of the locality the early workers determined on a small cross-cut 'tunnel.' Starting on the mountain side, well below the outcrop, they drove their adit easterly and in a direct course for 120 ft. Had they continued on this course they would have intersected the vein within 50 ft., but for some reason, now hard to conjecture, they then turned south—at right angles—and ran 110 ft., nearly paralleling the vein only 50 ft. away. At this point they made a right angle to the left, pursuing an easterly course again for 70 ft., and cut their ore, which was three feet thick. Here they again turned at right angle southward and followed the vein for 50 ft. At this point they sank 560 ft., following the ore at a dip of about 40°. The raising of material from this shaft was first done with the ordinary one-man windlass. Then by relays of windlasses, one stationed above the other; then by a skip on a skidway. The skids were placed securely on the floor of the incline-shaft, making a run-way for the skip. The skip was constructed of a plank some five feet long, with strips of scantling on the under side to serve as guides inside the skids. Sacks of ore were piled on the skip and the vehicle transported upward to the tunnel-level by means of the windlasses. Finally the skids were replaced by a track and the skip by a car. The track consisted of 2 by 4 in. scantling topped with strap-iron, and was extended through the drift and tunnels to the dump outside.

The orebody actually mined and milled was taken out of a block of ground 100 ft. along the vein and three feet wide, from the bottom of the shaft to the tunnel-level 560 ft. overhead. Operations were then suspended. Many years were consumed in making these workings. I am told that the little stope described supplied the owners with more than $150,000, besides abundance of specimens, chains, charms, rings, and jewelry to a multitude of relatives, visitors, friends, and employees.

I went into this old tunnel. No remnants of pipes appeared, nor any evidence of supports for pipes. There was no air-shaft, no opening to daylight save that small, crooked adit and the drifts with their numerous angles—nothing to get movement to the confined atmosphere, 560 ft. down the shaft. A thousand feet of narrow crookedness! Leave an unlighted candle in those old workings and it melts in fifteen minutes. Amazed, I asked how men could live in such a place. One man who had worked there answered, with a grin, that "They had no air," and that they used powder, too! The best of men in such a place could give but feeble physical effort in stoping or moving ore. The work must have gone slowly and been costly. The owners dropped out, sold out, and the property passed into other hands.

During the period of mining, the motive power used, though primitive, was not unprecedented. Its application, however, was unique. A one-horse whim was built on the ground and installed at the mouth of the adit. From this whim a small cable was carried through the tunnel, around the several corners, to the shaft and down it. The car was attached to one end of this cable. Guide rollers at intervals and sheaves at the angles furnished support. When the car had been filled in the shaft the horse attached to the sweep of the whim outside was notified and he proceeded patiently and faithfully to walk around, winding the cable on the drum above him. The mucker followed the car on its slow journey and dumped the contents onto a heap near the whim. Then he pushed the car through the tunnel and drift to get another load. As he shoved the car along, he replaced the dragging cable in guides and sheaves. By this method the little car, propelled by the horse, daily brought about 5,000 lb. of ore up the 560 ft. of incline shaft to the level, then around the corner, along the drift to the cross-cut, then around the corner, more tunnel, another corner, more tunnel and so on to the dump. Another handling by shovels (they had no bin) put the ore into sacks; then onto pack-trains or wagons for transportation, to an arastra at first, to a steam-driven mill later, a couple of miles away. The gold was free and amalgamation easy. This was the only 'easy' part of the entire process in those days.

Adverse criticism after an event is often unjust. Environment, extremely adverse conditions, disagreements among owners, usually over petty trifles, influenced and often controlled the doings of men. The facts stated here are for the purpose of comparison, illustration, and not in a spirit of criticism.

The ownership of several of those early claims recently passed to new men, old miners. The property now consists of seven claims, 140 acres. The new owners—there are only two of them—did not resume work where their predecessors left off. They started a shaft on a claim, the New Year, 2,000 ft. south from the old workings and on a fair outcrop, partly developed on the surface years ago, and followed the vein down 100 ft. Here, on cross-cutting, they found an orebody 25 ft. between walls, all free-milling ore; dip 60°. At a depth of 175 ft. the vein is 27 ft. wide. Still farther, southeast, on a contiguous claim, the Bullion, another shaft, at 130 ft. opened a vein full 20 ft. wide, all free-milling ore. At a depth of 300 ft., the vein is still gaining in strength.

On the New Year, hoisting is done with a 10-h.p. electric motor. On the Bullion claim, another electric motor has recently been installed. The Bullion is above the New Year and cars take the Bullion ore over a T-rail tram to a point above the New Year hoist and dump their content through a long chute into the bin of the New Year. From this bin trains of steel cars take the ore of both mines over another T-rail tram to the mill.

Of the mill it suffices to say that it is modern. Grizzley and rock-breaker deliver to a big ore-bin, whence automatic feeders supply the 10-stamp battery. Then comes plain amalgamation, on copper plates. A ditch three miles long brings water from a neighboring cañon and delivers 40 in. under 280-ft. pressure to a Pelton wheel. There is power enough for ten additional stamps. The mill treats 35 tons of ore daily. The water from the mill-wheel is led immediately to a second penstock where it enters a pipe extending down the hill to another Pelton wheel, where it drives an electric generator of 60-h.p. This runs the motors at the hoists, lights the whole camp,

and operates an air compressor. This power—the water-wheel and generator—is under the control of a governor by which practically normal and uniform pressure is maintained without burning armatures or blowing fuses. The turning on or off of a 16-c.p. incandescent light is noted by, and actuates, the governor at the power-house. By this wonderful machine an increased demand for power at one of the hoists is instantly met upon the movement of the hoisting lever at the shaft.

The extraction in the mill on plates alone is surely a record. A. E. Vandercook, the manager, assured me that the tailing from a $5 to $7 ore shows only 40 to 70c. per ton. There is practically no iron, no sulphides. The gold as it comes from its matrix is pure and clean. The ore is of good paying quality and I submit that this saving of gold on plates alone is a record.

The mine is at the base of the range, five miles by good road from Laws, the nearest station on the C. & C. railroad. From the camp and all the works the upper end of Owens valley appears, spread out like a patterned carpet on a floor.

TIN MINING IN BOLIVIA.—The trying condition under which the rich tin deposits of Bolivia are worked detracts from the success of their development, although the high percentage of tin would make them the richest tin mines in the world under ordinary climatic conditions. The Quinzi Cruz tin mining region is situated at an elevation of from 15,000 to 17,500 ft. above sea-level. Tin occurs in altered slate, with occasional bands or seams of porphyry, conforming to the strata. The tin ore is a mixture of cassiterite and pyrite occurring in a slaty silicious gangue in bedded deposits. A most peculiar feature is noticeable in connection with the value of the ore. That is, that the highest mines—those, say, above 16,000 ft.—are richest, the tin contents in lodes one to one and a half metres in thickness, running up to the average of 10% metal, whereas lodes in lower country are worthless. One mine, the Monte Blanco, was recently sold to a Chilian syndicate for £170,000 cash, a high price for an undeveloped mine. It is probably a good field, and will be developed in time, but climatic conditions are terrible at that altitude. Only Indians born in the locality can work, all imported men being unable to do more than just move about, on account of the rarified air. Although the district is well in the tropics, snowstorms are of frequent occurrence, both in summer and winter. The native so-called miners are now receiving five to six bolivianos per day (about $2) and the men are very scarce at that. The mine-owners, therefore, are endeavoring to secure Government sanction to import Japanese miners, as being hardy. Up to the present only primitive means are employed to treat the tin ore. The ore is pounded by means of a stone rocker—termed *kimbelletty*. The rough material is picked out and re-crushed. The stuff is afterward run over jiggers, steamed, and the slimes buddled. The tin is of a comparatively poor quality, and is only dressed up to 55 per cent.

GOLD STEALING.—The Royal Commission in session at Kalgoorlie, Western Australia, is unearthing several scandals and provoking some humor, both of which are useful. It has become usual for witnesses to admit that they destroyed "the butts of their check-books" and that they kept no accounts at all. In one case, a hole in the ground was used as a blind to explain the possession of stolen ore, and the witness gave the name of his mine as Randall's Hard to Find. When compelled to show the mine, the official who made the inspection found some shallow abandoned workings decorated with garbage and empty tin cans. The 'mine' had not been worked for many years.

Concentration in Montana.

By C. W. GOODALE.

*As the specific gravity of the ingredients of Butte ores is so widely different—the copper mineral varying from 4.5 to 5.5 and quartz being about 2.6—the question of separation is a comparatively easy one. The maximum size of the particles used in concentrating at present is 1/10 in. An average analysis of Butte ores may be set down as:

SiO_2	54.5 %
Al_2O_3	10.1 "
Fe	10.9 "
S	13.9 "
Cu	4.14 "
Ag	1.68 oz. per ton
Au	0.0127 " "

Twenty-eight per cent of the Butte output is available directly in the blast-furnace. Its analysis is approximately:

SiO_2	26.3 %
Al_2O_3	4.6 "
Fe	24.3 "
S	30.9 "
Cu	10.77 "

The fine concentrate requiring roasting and reverberatory smelting will average:

SiO_2	17.5 %
Al_2O_3	3.7 "
Fe	29.5 "
S	36.1 "
Cu	8.68 "

The slime from the tanks and overflow of concentrate constitute only a small percentage of the output. Forty per cent of the weight of the crude ore is taken from the plant as concentrate. After calcination there remains 80% of the weight of the concentrate. McDougal roasters reduce 35 to 36% S to 9%, but at the same time iron is oxidized, so that the weight after roasting remains practically the same, or 32% of the crude ore. In reverberatory smelting the matte produced is equal to one-fourth of the charge. The converter delivers 50% of the matte as blister copper, a 99% product. The final product is then 4%, or 80 lb. copper per ton of ore.

Electrolytic refining gives cathodes of 100% copper with gold and silver slime settling in the box. The cathode must be re-melted into three grades of product, namely: Wire-bars, cakes, and ingots. The copper absorbs sulphur from the coal, which is blown out by air, and a final reduction effected by poling.

Five-tenths horse-power per ton of ore is required for concentration. The costs in concentration may be given as:

Labor	$0.30
Power	0.10
Supplies	0.08
Insurance, management, etc.	0.02
Total cost per ton	$0.50

7,680 gal. water are required per ton of ore in concentration.

In electrolytic refining, 2,500 h.p. will produce 4,500,000 lb. copper per month.

Hydraulic classification means a great deal of water. This may be reduced and the slime thickened by using conical vats. The slime is admitted at the centre of the vat and a concentration of six to one effected. Instead of settling, slime may be concentrated on wooden-deck tables. The volume of slime may be reduced by a change in apparatus used, for example, a Hancock jig required 919 gal. water per ton, while the Evans required 3,457 gallons.

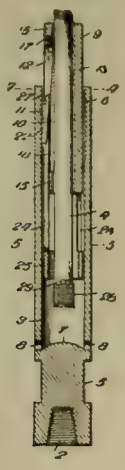
IT is claimed that fig trees can be grown on the piles of gravel deposited from the dredges at Oroville. An effort is to be made to level the ground for cultivation.

*From *The Bulletin* of the Colorado School of Mines.

MINING AND METALLURGICAL PATENTS.

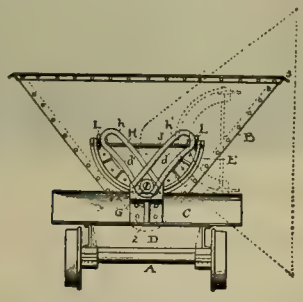
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ROPE-SOCKET. — No. 833,548; James K. Putnam, Montpelier, Indiana.



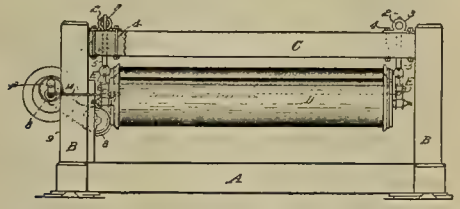
The combination of a body having a socket formed therein with corrugations in its outer portion, a holder slidably mounted in said socket, a socket-engaging jaw carried by said holder to force said jaw into engagement with the corrugations of said socket, and means for retaining a rope or the like in said holder.

DUMP-CAR.—No. 834,934; Henry A. Reader, Cleveland, Ohio.



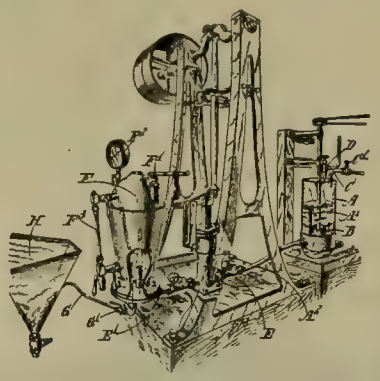
In dumping-cars, a supporting-frame having straight transverse tracks at each end, in combination with a triangular car-body having one of its angles set centrally of said frame between said tracks and the other angles at the sides and top thereof, a segmental carrier on each end of the car-body above the lower angle thereof adapted to roll on said tracks, and a projection from the middle of each segment provided with a roller on the end thereof, and a fixed upright centrally behind said tracks having diverting slotted wings adapted to be engaged by said roller as the car is rotated, and means at the ends of said segments to hold the car-body in upright position.

ORE-CONCENTRATOR.—No. 833,415; Frank E. Pearson, San Francisco, California.



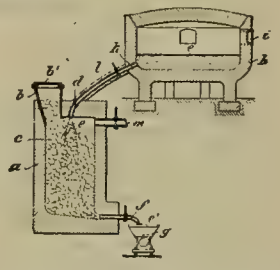
An improved ore-concentrator consisting of a main frame having vertical end standards, transverse beams connecting the upper portions of said standards, an independent frame within said main frame below the top of the standards, an endless belt operable in the independent frame, boxes mounted upon the transverse beams of the main frame, parallel shafts extending from one transverse beam to the other and having their ends supported in said boxes, said shafts serving as top braces for the standards of the main frame, and said boxes being adjustable in the direction of the length of the transverse beams, rods mounted on the shafts said rods depending from the shafts and having their lower ends pivotally connected to the independent belt-carrying frame whereby said latter frame is hung directly from the shafts, the opposite ends of said shafts being independently adjustable, and means for oscillating the independent frame in a transverse direction.

ORE CONCENTRATION.—No. 835,479; Henry L. Sulman, Hugh F. Kirkpatrick-Picard, and John Ballot, London, England.



The process of separating powdered minerals from one another which consists in suspending the powdered minerals in a liquid, subjecting the mixture to a gas-pressure and thereafter relieving the pressure whereby bubbles of gas are liberated in the pulp and carry certain minerals to the surface.

PROCESS OF OBTAINING METALS AND COMPOUNDS THEREOF.—No. 833,472; Hermann Mehner, Berlin, Germany.



The described process which consists in bringing in contact with each other a compound or compounds of a metal or metals, an agent capable of generating metallic vapors from said compound or compounds, and an incandescent fluid heat-carrier, and leading off the vapors and gases for separation, substantially as described.

PROCESS OF TREATING COMPLEX SULPHIDE ORES.—No. 832,341; William G. Rumbold and George Patchin, London, England.

The process for the extraction of zinc and other metals from complex oxidized ores containing zinc; consisting in passing over successive lots of crushed ore a solution consisting of ferric sulphate, sulphuric acid, sodium chloride and water, until such solution becomes saturated with dissolved matter, such dissolved matter consisting of the zinc, and also the copper, cadmium, manganese, nickel, cobalt, antimony, lead, bismuth, and tin, or any or all of these metals when contained in said ores, a small proportion of ferric sulphate being employed in the solution in relation to a large amount of sulphuric acid whereby the ferric sulphate is continuously decomposed and regenerated until all the free acid has become neutralized substantially as set forth.

An Important Pumping Plant.

The installation of the pumping and power plant for the Denver Union Water Co., at the mouth of Platte cañon, twenty miles from Denver, is unique and interesting. It is unique on account of the manner in which the machinery is installed, and interesting on account of the method employed in furnishing the water supply for a city the size of Denver. The system was designed by George T. Prince, chief engineer for the water company, the machinery being supplied and installed by The Denver Engineering Works Co. In order to get the best results from the plant it became necessary to mount the 80-h.p. Victor water-turbine on a steel frame-work 14 ft. above the engine-room floor. This turbine is driven by water brought from the Platte river, a considerable distance, to a large reservoir about one-half mile to the east of the power and filtration plant and through a 36-in. pipe to the turbine. The turbine is used for operating the De Laval pumps, and the water discharged from the water turbine is delivered to the filtration beds. There are six beds or tanks in all containing something like nine acres. Each bed or tank is covered on the sides and bottom with six inches of concrete, about seven inches of coarse gravel, five inches of medium gravel, and three feet of sand, through which the water is allowed to filter, after which time it passes to the mains for use in the city. In case of accident to the water turbine a 75-h.p. De Laval steam turbine may be coupled in by means of friction-clutches which will serve to operate that unit. In the station there are two De Laval steam turbine-pumps, one of which is 55-h.p. 3,500 gal. per min., 43 ft. lift, and one 35-h.p. 2,000 gal. per min., 43 ft. lift. There is one duplex steam-pump for washing the filter sand. After the water is allowed to pass through the sand and gravel for about a month the sand becomes coated with sediment and it is necessary to shut off the water from this particular bed and remove the sediment which has collected from the surface, perhaps one inch thick, and take it to the cleaning-vat, where it is washed by means of the pump just referred to. The sand is allowed to dry and again used for filtration purposes.

The plant also contains one 55-h.p. lighting plant; two 132-h.p. Babcock and Wilcox boilers, with dutch oven furnaces. The steam turbines and pumps are placed below the floor, so as to make the plant very compact. The steam turbines exhaust into a Wheeler condenser—the water delivered by any of the pumps acting as cooling water. The condensed steam is delivered to a Cochrane feed-water heater by means of an Edwards air-pump, and the water from the feed-water heater is delivered to the boilers by means of a Knowles duplex outside-packed plunger-pump. After the water passes through the filtration beds a portion of it is forced into a main by the De Laval pumps, and it is estimated that the three units will handle 15,000,000 gal. water per 24 hours. The water company has spent an enormous amount of money endeavoring to make the water supply for the city of Denver as complete as possible.



Denver Union Water Co.'s Filtration Beds and Power-house.

Commercial Paragraphs.

THE JEFFREY MANUFACTUING CO. of Columbus, Ohio, issues Catalogue No. 31. It is a handsome publication devoted to pulverizers and their appurtenances.

THE INGERSOLL-RAND CO. of New York has issued Bulletin No. 2,011 on the Little Jap hammer drill. It illustrates the varied uses to which this useful tool is put.

THE WELLMAN-SEAVER-MORGAN CO. of Cleveland, Ohio, issues an attractive booklet entitled 'What We Do' in ore and coal handling machinery. The illustrations tell their own story.

THE INGERSOLL-RAND CO. has issued Bulletin No. 2,008, on Imperial Motor Hoists and Stationary Motors. The pamphlet contains complete descriptions and tables, as well as lists of machine parts, for the convenience of purchasers.

THE CHICAGO PNEUMATIC TOOL CO. issues a handsome catalogue devoted to a description of the Franklin air-compressors. Constructive principles are given in detail and numerous tables and formulas render the publication useful.

THE magnificent plant of the Santa Ana Valley Irrigation Co. was built by the WESTERN GAS ENGINE CO., of Los Angeles. The machinery works admirably and will contribute largely to the success of this important irrigation system.

The original plant of the Standard Consolidated Mines Co., built according to the recommendations of the consulting engineer, H. H. Nicholson, showed that a good saving could be effected by a simple concentration process and ALLIS-CHALMERS crushing rolls. The mill has a daily capacity of 100 tons, and will be in operation by the end of November. Those rolls are designed to crush 35,000 tons of ore per year.

THE STANDARD ELECERICAL WORKS was the first of the burnt-out San Francisco electric firms to resume business in a permanent location, the Atlas Bdg., at 606 Mission St., San Francisco. They carry a full line of electrical supplies for mines, and are able to make prompt delivery from their warehouses. They are Pacific Coast agents for Simplex Electrical Co., insulated wires and cables; Simplex Electric Heating Co., electric heating apparatus; Electric Machinery Co., generators and motors; Mechanical Appliance Co., D. C. motors, small sizes; Century Electric Co., single-phase motors, A. C. ceiling fans; American Vibrator Co., electric vibrators; Triumph Electric Co., D. C. generators and motors; Warren Electric Mfg. Co., steam turbines and A. C. generators; Commercial Electric Co., two and three-phase induction motors; Jandus Electric Co., enclosed arc lamps and fan motors; Lafayette Electric Mfg. Co., Hornberger transformers; Duncan Electric Manufacturing Co., A. C. and D. C. wattmeters; Jewell Electric Instrument Co., portable and switchboard instruments; DeVeau Telephone Manufacturing Co., telephones; California Incandescent Lamp Co., incandescent lamps. Their facilities for supplying mines are further displayed in their advertisement on page 51.

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Editorial.

FIRST the earthquake and fire; then Schmitz and Ruef; lastly the Big Stick. Poor old San Francisco! When restless nature and degraded man, when the lowest and the highest unite to discipline her, what shall she do but murmur Bret Harte's lines

"Serene, indifferent to Fate,
Thou drawest all things, small or great."

HAVING REGARD to recent events, it is interesting to note that Cuba's export trade with the United States during the fiscal year just ended amounted to $84,979,831, and her imports from this country to $46,377,277. Sugar accounts for $60,208,148 of the exports from the island and tobacco for $17,474,269. The only mineral product specified is iron ore, to the amount of $2,052,501, against which Cuba took $1,801,586 in American coal.

THERE IS a movement afoot to establish a school of mines in Nevada county. This is one of the oldest and most progressive gold-mining districts in California, and if a local institution of this kind is to be established, no better locality could be chosen. It is possible that such a school could be conducted in friendly co-operation with the mining department of the University of California, at Berkeley, the idea being to give a practical course among the environments of actual mining, while on the other hand the students from Nevada county might visit Berkeley and listen to a special series of lectures on some other subject.

THE same daily paper that announced that there had been a competition in essays on 'The Ethics of the Modern Newspaper' at Stanford University, devoted a whole page to a fraudulent advertisement of shares in an invention, which, it was promised, would ensure a life income to the purchaser of stock. Ethics is a large word for such small business. Robbing the poor and deceiving the simple come within the meaning of graft, which our San Francisco papers pretend to be fighting, with wordy editorials and vain protestation.

THERE is anxiety at Mt. Bischoff, the premier tin mine of the world. Advices from Tasmania state that the manager, Mr. H. W. F. Kayser, has been compelled to acknowledge his inability to maintain the present production and shares have fallen from £55 to £35. However, this grand mine has looked sick before and yet regained vigorous productiveness, so we shall hope that new orebodies may be discovered to compensate for the exhaustion of reserves.

WE sympathize with the movement for good roads and note, with pleasure, that the recent convention at Denver was well attended. The citizens of Colorado, led by Mr. Thomas F. Walsh, are endeavoring to secure the

legislative appointment of a State Highway Commission, the business of which will be the construction of a system of good roads. We hope it may become a fact, for a mountainous country like Colorado cannot be wholly served by railroads and anyone familiar with its less accessible localities knows how much there is of mineral for the miner and scenery for the traveler that is at present out of reach, simply because a burro trail is not yet the equivalent of a highway of civilization.

Progress in Cyanidation.

The article on 'Recent Improvements in the Cyanide Process' by Mr. F. L. Bosqui, will command attention, being written by one who is in the thick of current practice. Mr. Bosqui favors filtering machines of the Moore-Butters type and is inclined to consider, as Mr. Alfred James does, that filter-presses will shortly be relegated to the background. This appears open to doubt. Two large facts are against it, namely, the continued use of presses at Kalgoorlie and the successful improvements recently made by Mr. C. W. Merrill at the Homestake. From Kalgoorlie we hear good news of the Ridgway invention, a horizontal revolving automatic vacuum filter, but this machine has yet to be tried in the United States. At present, of all the sand leached at Kalgoorlie only a few thousand tons are treated by devices other than filter-presses. All the larger mines in the back country use them and the Ivanhoe is now erecting a new filter-press plant. Filter-pressing at Kalgoorlie now costs about 35 cents per ton, and leaves 12 to 15 per cent moisture in the cakes; it is believed locally that a new plant on a large scale could be operated for not more than 25 cents per ton. Of course, in regions where water costs nothing and the original slime is docile to treatment, the filtering machines will make a better comparison with presses. Meanwhile, Mr. Merrill's work is bound to encourage the advocates of the older method. He has enlarged its scope and simplified its details. With 24 filter-presses, each weighing 65 tons, and each of 26-ton capacity (as compared to the old 6-ton presses), he expects the total cost of treating slime to be not more than 25 cents per ton. The mills make 1,600 tons daily of this product, and 2,400 tons of sand. A test has been made on 6,000 tons of slime. In charging, he uses a pressure of 35 pounds; while leaching, 12 to 15 pounds; and to sluice with, a pressure of 65 pounds per square inch. Out of a slime containing 91 cents, he extracts 83 cents. Mr. Bosqui gives other details; those we quote are from Mr. Merrill himself. It is a remarkable fact, worthy of note, that after 28 years working, 35 per cent of the Homestake ore still comes from surface excavations. Another matter under trial is the use of zinc dust as against shaving; the former is gaining ground in America. We are informed that at the Waihi, treating 25,000 tons per month, it requires seven men continuously to clean the boxes, using zinc shaving; at the Homestake, treating 45,000 tons per month, only four men are employed a half-day, using zinc dust. In all these matters there is a constant effort to improve, and it is only by unprejudiced tests that the best method can be determined. On another page, Mr. E. H. Nutter adds greatly to the value of our Discussion Department by a letter in which he compares the use of the Moore and Butters filters. Such first-hand information from practical men will be of service to all those who use cyanide in milling. We trust other friends will not hesitate to put their experiences on record, where it can be of general service.

Gambling in Mining Shares.

The craze for mining stocks has become a speculative debauch; someone will soon wake up with a head-ache, possibly a heart-ache, too. It is an everyday blunder to suppose that gambling in shares on the say-so of irresponsible people is 'mining;' it is no more mining than the funny business of the turf is horse-breeding. The affair of Dr. Lyman, the Goldfield consolidations, and the Nipissing episode all mark the beginning of a collapse in the trading of mining stocks of the purely speculative kind. Of the Nipissing episode there is not much to be said except that when people like the Guggenheims and Capt. De Lamar engage in a financial tussle it is best to give them plenty of room. For the public that bought Nipissing up to $34.50 on the statement that the Guggenheims had bought a block of 400,000 shares at $25 per share, we have much sympathy, but no respect. They came between the upper and nether millstones of two resourceful combinations and were ground exceeding fine. When Nipissing fell to $14.50, it may have been due to an organized bear raid and many must have suffered, but what could they expect when they bought risky mining shares on a margin during a boom? The Guggenheims are being blamed for the fiasco and while they can technically disclaim any fault, the recent occurrence does indicate that any financial house that desires respectability must avoid such entanglements. How? Well, by preventing the premature announcement of a deal that is not consummated and of contradicting any statement that is calculated to mislead. The Dr. Lyman affair brought out the fact that one of the 'securities corporations' was the expression of financial activity on the part of a news bureau at Tonopah. They make history so fast in the new mining camps that bucket shops become trust companies and gamblers are metamorphosed into bankers almost while you wait. All of which only becomes manifest when the bubble has burst and its iridescent films fall like chunks of brick on the heads of the unwary. As to the Goldfield consolidation, it is safe to say that more money is lost in rich mines than in poor prospects. The four mines already consolidated are capitalized at $50,000,000 and are selling at $42,500,000. Does anyone realize the amount of ore required to justify such a price? The Company's circular states, that including prospective ore, "the future production from the now known ore-shoot" should be "at least $30,000,000." Of this, on a favorable estimate, about $20,000,000 may possibly be profit. To make good on a capitalization of $50,000,000 there is required a gross production of $65,000,000 to pay back the capital; with dividends at 10% and five years to return the capital, another $25,000,000 of profit, or say, $40,000,000 of ore is needed.

At least $100,000,000 must be taken out of this group of mines in order to justify the capitalization. Nor do we say that it will not be done, but the proof is wanting, and very few people know what they are paying for when they take shares at their present valuation. Of course, they expect to unload upon the other fellow, but in the end the loss to the honest portion of ths community and to legitimate mining is the difference between the inflated price and the true value. The purchase of the Combination mine for $4,000,000 does not represent sound judgment; it may indicate a speculative spirit, some of which is always a useful factor in mining, but four millions for a mine that has paid only $786,000 in the last 25 months and that is only 300 feet deep, looks like a gambler's throw. When Messrs. Winslow and Hubbard bought the prospect for $75,000 they exhibited good judgment, and they have since profited by the speculative exuberance of their neighbors.

Cobalt and Goldfield are today the excuses for the two greatest gambling affairs on record. At Cobalt the mines already organized into companies represent a market value of $200,000,000, while it is a fact that the entire output of the district since the first ore was shipped reaches only $5,000,000. We do not deprecate an eager interest in mining, only the insane gamble that uses mining for an excuse. One of our contemporaries the other day expressed surprise at our depreciation of speculation in small-priced mining shares, because from its point of view any money that went into mining was so much to the good. The fallacy lies in the notion that buying paper certificates or playing with them, is mining; the fact is that in times of a boom like this the amount of actual work done underground in ratio to the financial operations based upon it, is humorously out of proportion. What is more, the mining profession suffers; boom mines need optimistic people not hampered by too sacred a regard for truth and the flotation of wild cats needs only the service of the wild-eyed among make-believe experts. In Nevada today there is many a promising young mining engineer who is being undone by the gambling fever, who makes his office a bucket shop and his technical training a lure for the ignorant. Another evidence of the barter of self-respect for quick gain is that of the mining engineers who permit the use of their portraits in the flamboyant advertisements of a mining prospectus and in disreputable newspapers. Two such cases have attracted our attention lately. Such performances are most regrettable. Real honest work is everywhere corrupted by the atmosphere of greed. It is all rubbish to speak of it as being to the advantage of this community to have a big stock boom long continued. The money that is made nefariously finds its way chiefly into the hands of those that are on the edge of the criminal class, to the kind of people that are today before the Grand Jury. Such money never builds a City or makes a community great. It is bathos to talk of the glories of the Comstock when reference is meant to the thievery and corruption of the boom days, forty years ago. We want to see Nevada as prominent in the mining world as it was then and we hope to see it as splendidly productive, but in Heaven's name let us have no repetition of the dirty scheming that was an integral part of the Comstock story.

One feature only of the present boom is satisfactory and that is that while widespread and large in volume, it has not scaled the giddy heights of older performances. The Curb is deluged with stocks of newly organized companies operating at Cobalt, in Nevada, and in Mexico, but the loss will fall largely on gamesters and on lambs that know how it feels to be shorn. As soon as the capital of these and of other simpler folk is exhausted, the reaction will come, like a shower after a brilliant display of lightning. We may recall ancient history and state that at the end of the bonanza craze of 1875, the shares of the California mine receded 60 per cent in one week. Consolidated Virginia dropped from $700 to $500 per share; a few years later this stock sold at $1.90 per share and California, which once soared to $780, fell as low as $1.25. In five years the mines that had stood on the market at $393,000,000, were selling on the basis of $7,000,000. In 1868 Alpha sold at $1,570 and in 1870 it fell to $3 per share; during 1872 Belcher sold as high as $1,525 and as low as $1.50; later still it brought only 25 cents per share. In 1881 New York had a mining boom of its own and it lasted as long as capital was poured in. Then it went to pieces. The Leadville shares suffered most; Little Chief was selling at $18 and eventually was quoted at a few cents; Little Pittsburgh rose to $45 and the mine was sold for debt not long afterward. These facts should be enough to warn the inexperienced, but warnings as a rule are like the ointment that went down Aaron's beard, even unto the skirts of his garment—simply a waste of good material. Unfortunately many people never get beyond this infantile stage of mining; becoming shorn by the bears, they go bleating into a cold world and protest that they have had enough of it. As a matter of fact, the vagaries of the stock exchanges are related to the industry of mining as the betting on the racecourse is to the ownership of a good horse, the breeding of fine animals, or the health-giving exercise of riding across country.

THE PLAINT of the underpaid professor is heard in the land. His salary remains fixed, while the cost of the necessities of life, not to mention its luxuries, mount higher and higher. Professors have no union, they are unable to keep out apprentices or to excommunicate those who are willing to work on a stipend even smaller than their own. In San Francisco the hod-carrier gets a bigger wage than the man who is training the youth of California at her State University. It is a blot on civilization; it is a joke on learning. But there is another meaning, less obvious, but more true. Men of culture are willing to pursue avocations that afford but a small financial return, because they love their labor and make it part of their life. The hod-carrier works to eat and sleep, the usefulness of the building he helps to erect is no part of his purpose; but to the professor the routine of daily work is illuminated by the sense of doing something that counts, and is alleviated by studies that enlarge his horizon, stimulate his imagination, and make him feel that everything in life is not measured by the unit of the dollar. Man does not live by bread alone.

Special Correspondence.

London.

Kaffir Market Dull.—Other Descriptions Active.—Excitement in Deep Leads.—Activity in Siberian Ventures.—Another Cornish Flotation.—The Dolores Meeting.—Complaint As to Transmission of News From American Managed Mines—Oroville Dredging.

The spotty nature of the market for mining shares, remarks *The Globe*, is revealed by yesterday's making-up list. While the South African section, apart from diamond descriptions, has been almost lifeless, several other departments have come prominently forward, and the bulls of a number of shares which a short time ago were lumped together as miscellaneous descriptions, have certainly good cause for congratulation. Unfortunately, the outlook for Kaffirs shows no signs of clearing, and even if the Letters Patent for the new Legislature are granted within the promised period there still remains the uncertainty as to how the elections in the Transvaal will result. It is to departments other than South African that one has to look for the biggest movements. In fact, here and there the gains are almost sensational, as quite a boom is in progress in Siberians, Barriers, Deep Leads, and Coppers. The first-named provide the feature of the past account, Siberian Proprietary having risen as much as £5¼, from 9 to 14¼. Siberian Syndicates have put on 1 5/16, and Orsk Goldfields nearly ¾. In Broken Hill and Deep Lead descriptions some substantial gains have resulted from the active buying that has been in progress during the fortnight. Australian Commonwealth Trusts, which are now fully paid, carried over yesterday at 3½, as compared with 1 9/16 premium on the last occasion, which represents an improvement of 1 5/16. Broken Hill Proprietary and Block 10 have gained 1 1/16 and ⅝ respectively, and Loddon Valleys, 10 shillings.

Deep Lead stockholders have been kept on the *qui vive* this week. Two cablegrams have appeared in the press, the first to cheer their spirits, the second less inspiring. To start with, the news was to the effect that "No. 2 rise, wash half-way across the face, just at point laths. Washed 2 ft. by 2 ft. by 1 in. ground, ¾ dwt. nice sample gold. Cannot estimate the value of wash until we get more of face. About 1 in. sand on the bedrock. Tight wash above. D. H. Brown at the mine; (he has) telegraphed prospects decidedly encouraging. It is not possible sample fairly until (bedrock) dips. Caution must be exercised in estimation of values. We are now opening up (with) all speed." The market seems to have found some difficulty in understanding this cablegram. One dealer is reported to have sat up half the night endeavoring to get at its meaning, but went to bed without having succeeded. There were others, however, who imagined they detected a bull point and proceeded on the strength of their superior insight to acquire some shares, or induce their brokers to do so for them, to 'carry over' for the rise. It came, but worse luck! the second cablegram gave the bears a look in. Here it is: "No. 2 rise—Have cleaned up 4 ft. by 3 ft. by 6 in.; obtained 2½ dwt. of gold. Cement in wash shows gold. Owing to looseness wash, flow of water too strong; have ceased operations this point for the present. Pushing on drive turning north on No. 2 rise to enter into different points. Pushing on other points highest possible speed." Office note: "The company's engineers state that, in their opinion, no importance is to be attached to the flow of water from the wash on the first entrance, as this is usual, and they anticipate it will only require a few days for the flow of water to decrease to a point at which work can be resumed." Speculators may now be assumed to be sitting up burning the midnight oil in making forecasts as to how many days will pass before the decrease of water and the re-working of the golden wash will enable them to close their bargains at a profit. The Loddon Deep Leads (Victoria) has not yet reached such an exciting stage in its history. The directors have a more prosaic duty to perform, and in submitting their second annual report and the accounts of the company for the period ending October 31, 1906, they are in the happy position of being able to inform the shareholders that arrangements have been made to finance the company without calling upon them for further assistance, and they are confident as to the early success of the company, for the following reasons:—"(1) We have proved that there is a lead on our property, that it consists of boulders, water-worn pebbles, etc., considered and reported on as of a very favorable nature, and also that it is gold-bearing. The finding of this gold on the western edge of the lead is considered very promising, as the gold, as a rule, hugs the eastern side. (2) The consensus of opinion from the shallow depth of drift, the nature of surrounding country, is that we shall not have a very great volume of water to contend with. (3) By strata passed through from 207 to 213 ft. and again at 227 ft. it has been proved that a strong network of quartz leaders was passing through the shaft, the stone is hard and a darkish color, and by assay shows a trace of gold."

The latest Siberian prospectus is that of the Kluchi Gold Mines Ltd., the first subsidiary of the Nerchinsk Co. The capital of the new venture is £280,000 in £1 shares, of which 115,000 have been underwritten and are offered at par. Shareholders in H. A. Syndicate, Siberian Mines, and Nerchinsk, will have the preference in allotment. The prospectus states that the Company has been formed to acquire the gold mining rights of the Mount Kluchi block in the eastern part of the Nerchinsk mining district of Siberia. Of the considerable expenditure that has already taken place, the Company will have the benefit. It is stated to be no less than £54,000 in development work and the purchase of machinery. The report of Pearse, Kingston, & Browne, consulting engineers to the Nerchinsk Co., appears in the prospectus. It anticipates that within a few months, the present mills, capable of crushing 100 tons per day, will be in full operation, and that the profit will amount approximately to £40,000 per annum, even should the contemplated increase of power not be made.

Not to be outstripped in flotations, Cornwall also appears with a prospectus this week. The Wheal Commerce Tin Mine, Ltd., is the latest candidate for public favor. It is a producing tin mine, the past workings of which "indicate present value and possible future profits." The capital is £50,000 in £1 shares, of which 44,000 are offered for subscription at par—25,000 being reserved for working capital. The Company proposes to acquire the Commerce tin mine, in the parish of St. Ewe, 3½ miles from St. Austell, along with the plant and machinery which include 10 heads of Californian stamps and 14 heads of Cornish stamps, while capital is provided for adding 40 more stamps. The property consists of about 600 acres, and is held on favorable terms for 21 years from June, 1900. Work has been done upon two main lodes, the Vertical and the Commerce, which have been traced for nearly ¾ mile, and there are also other lodes. The shaft on the Vertical lode is down 320 ft., and a sample from the bottom working assayed 40 lb. black tin per ton. This lode, Mr. Harold L. Twite, who has reported upon the property, recommends should be vigorously pushed forward, which will, "if present width be maintained," yield 28,000 tons of ore. Tin to the amount of £7,272 has already been sold, as the result of

past "experimental work." The average value is reported to have been 30 lb. black tin per ton. The total working costs are estimated at 13s. 6d. per ton. It is calculated that with an output of 50 tons a day, and allowing 15s. per ton for working costs, the credit balance will be £12,185, which would allow of a dividend of 20% per annum upon the capital. These estimates are stated to be based upon black tin at £100 per ton, and also presumably on the assumption that the present width of the lode is maintained. The following is a summary of the fortnightly tin 'ticketing' at Redruth:

Amount of tin sold	243 tons.	
	£	s. d.
Total realized	27,159	7 6
Metal standard	195	12 6
Black tin average	113	0 0
Dolcoath, 70 tons	8,314	17 6
Carn Brea and Tincroft, 33 tons	3,331	12 6
Basset United, 33½ tons	3,370	2 6
East Pool and Agar United, 25 tons	2,751	7 6
Grenville United, 25 tons	2,806	10 0
West Kitty, 16 tons	1,858	0 0
Clitters United, 15 tons	1,753	2 6
Levant, 15 tons	1,746	7 6
Wheal Kitty and Penhalls United, 4 tons	465	0 0
Geevor, 3 tons	297	7 6
Wheal Jane, 2 tons	230	5 0
Mulberry, 2 tons	199	10 0
Ballswidden, 1 ton	106	2 6
Birch Tor and Vitifer, 1 ton	129	15 0
Tehidy Tin Streams, 1 ton	78	7 6

It is expected that within a few weeks South Crofty will be added to the ticketing list with the first parcel of black tin after treatment through its new magnetic separator. Good progress is reported at Condurrow United. The engine-house is up and the roof is in course of construction. A head-gear 60 ft. high and a capstan have been erected. One boiler is in position and another is being lifted in. At the adit the first cistern has been constructed and the pitwork from that point to the surface almost completed. As soon as the engine has been installed, pumping will commence.

At the second annual meeting of Dolores Ltd. the chairman referred with regret to the retirement of Messrs. Farish and McCarty as consulting engineers and to the appointment of George A. Schroter—"a mining engineer of the highest repute"—to fill the vacancy. Further capital outlay would have to be made, the chairman said, amounting to £20,000, the largest items being for additions and improvements to the mill. He reminded the stockholders that the capital expenditure already made had absorbed the original working capital of £30,000 and also the £50,000 net profit on the working of the mine. Hence the necessity for the proposed new capital of £70,000 of which £66,000 would be issued forthwith at the price of $5 per £1 share. The new shares would be offered *pro-rata* to the shareholders and the subscription list would be closed on December 31. Referring to the new management, the chairman stated that Mr. Schroter has appointed Mr. H. Paul as manager. Mr. Paul assisted Mr. Schroter when he was at the mine three years ago, and he practically had charge of the mine for the first six months, and in a letter to the president Mr. Schroter says he considers everything is progressing well at Dolores, and that the mine is in good shape and everything well systematized.

As to ore reserves: Mr. Schroter's estimate of net value contained in ore, tailing, and dump, was $1,200,000. The chairman remarked that his estimate of £240,000 net for ore reserves did not seem to tally with former estimates; for in 1903 he estimated the net value of ore reserves at £290,000, which ought to be still maintained if Mr. Farish is right in his opinion that developments during the past year have equalled in net value the profit taken out of the ore. With regard to developments on the bottom, or 4th level, it seems the vein was struck by a tunnel from the bottom of the shaft about 28 ft. to the west, showing very low values; but in driving north on the vein during the past few weeks the values had increased to $30, and, judging from the 3rd level, the values should further increase going north. As to the development by cross-cut No. 4, at a point 186 ft. north from the shaft a slight fault was encountered, and beyond this, about 130 ft. was driven through almost barren ground, when ore was again encountered, showing values for about 30 ft. of $25.

Cross-cut No. 4 was started to the west about 50 ft. north of the fault, and has struck $160 ore 2 ft. thick with ore in forebreast assaying $68. A director, in seconding the adopting of the report and accounts, said the position of the mine was, in his opinion, more satisfactory than it has been for some time past, and he understood from the American board, with whom he had been in communication, that the Company would be dividend-paying within two or three months from now. An account of the meeting would be incomplete without some notice of a shareholder's remarks on a feature of American managed mines on the London market. He said he wished to add a word or two with regard to the reception of news in London from the American directors. Some of the shareholders in this Company were also interested in another Mexican mining company where there had been considerable delay in the transmission of rather important news relating to developments at the mine. That delay appeared to arise through considerable time being required for the consulting engineer to make his report to the directors of the American company, for them to carefully consider the result of that report, and then finally to cable the same to London. During that interval any advantage that might accrue to an English shareholder was likely to be entirely lost by its premature disclosure on the American market, and he had been very much interested in listening to what the chairman had stated regarding the steps which he had taken when in New York to ensure the prompt receipt of all information relating to developments and other important news from the mine on the London Stock Exchange; and he certainly hoped that the directors of the Dolores would set an example in that respect, which he was sure would be very gratefully received by the shareholders of the company.

The chairman said he could assure the shareholders that there was nothing he felt more strongly about than the importance of their receiving on this side the earliest possible information and letting the shareholders and the public have the benefit of it. The board had arrived at a distinct understanding with Mr. Farish that all cables and his reports to the American board should be made in duplicate and be sent to London at the same time. He expected Mr. Schroter would carry out the same system.

Stockholders in Oroville Dredging have been notified that the gross returns week ended November 12 amounted to $25,000, bringing up the total to $949,000, since the Company started on August 1, 1905. Also that 12 dredgers are now in operation on the following properties, namely: 3 on the Boston & California, 4 on the Boston & Oroville, 3 on the Exploration, and 2 on the Bear River. The Directors have declared a fifth quarterly dividend of 12½c. per share, payable at Boston on December 29 to shareholders of record on December 15. Mr. Weatherbe's letter on 'Gold Dredging' in your issue of November 3, should be read by all stockholders in Oroville Dredging Ltd. for *inter alia*, the information it conveys as to average recoverable values, working cost, and net annual profit.

Butte, Montana.

Output of Copper in November.—A Decrease.—East Butte Affairs.—A Favorable Report.—A Squabble Over a Title.—Explorations by the Reins Co.—Alliance Strikes it Rich.—Operations of Butte Men in Arizona and Idaho.

The copper output of the Butte district in November amounted to 26,600,500 lb., a decrease of 2,292,740 lb. from the previous calendar month, due chiefly to the fact that the Parrot company has dropped its production to about 200 tons per day while extensive new orebodies are being opened, and the Original company, always uncertain in its output, is mining in a very lean zone at present, and a number of the mines were closed for a day or two on account of cold weather. The different companies contributed to the November output as follow:

Company.	Tons of ore.	Pounds of copper.
Boston & Montana	90,000	6,840,000
Anaconda	102,000	7,446,000
Butte & Boston	17,400	1,218,000
Washoe	15,000	1,050,000
Parrot	6,000	348,000
Trenton	17,400	1,183,200
North Butte	30,000	3,540,000
Butte Coalition	28,500	2,052,000
Original	18,000	1,080,000
East Butte	6,750	607,500
Pittsburgh & Montana	4,500	396,000
Miscellaneous	12,000	840,000
Total	347,550	26,600,500

The daily output of ore and the average yield per ton in copper were as follows:

Company.	Tons per day.	Pounds of copper per ton.
Boston & Montana	3,000	76
Anaconda	3,400	73
Butte & Boston	580	70
Washoe	500	70
Parrot	200	58
Trenton	580	68
North Butte	1,000	118
Butte Coalition	950	72
Original	600	60
East Butte	225	90
Pittsburgh & Montana	150	88
Miscellaneous	400	70
Total	11,585	

Frank H. Probert of Los Angeles, geologist and mining expert for Thomas F. Cole and the General Electric Co., has been in Butte for several weeks examining the mines of the East Butte Copper Co. and other properties. Mr. Probert has made a favorable report on the East Butte and strongly recommends the erection of a 500-ton concentrator for the treatment of the company's low-grade ore. He reports that in No. 11 mine, known as the Yankee Boy, he found at a depth of 225 ft. a vein 52 ft. wide that will average 4% copper. In No. 1 shaft, in the south cross-cut, he found a vein 15 ft. wide a short distance from the shaft, and another of equal width north of the shaft. Much of the ore in those two veins is first-class. The ore from the 400-ft. level up to the 200 is practically undisturbed, and Mr. Probert suggests that good judgment and economy make it advisable to mine this ore under the present high copper market, rather than confine work entirely to development. Mining and development could be carried on together. A 500-ton concentrator in two units, could be built for $250,000. Mr. Probert also recommends that lessees be permitted to continue work on the levels above the 200, it having been the intention of the company to stop all leases on the first of the year. He thinks the lessees can mine that portion of the property more economically than the company, and that the 25% royalty received is a good item. There are also two small concentrators on the company's ground, operated by lessees, paying the company 25% royalty, and in addition to that a large precipitating plant is operated by others who are saving a lot of copper from the water and tailing deposits on the company's ground, the company receiving 25% of the copper so recovered. The main shaft of the East Butte has reached a depth of 625 ft., and a station is being cut at the 600-ft. point, from which cross-cuts will again be run north and south. No indication of the iron zone that has been found in some of the other mines in that locality near the surface, has yet been encountered, and mining men generally now express the opinion that the zone will not be found at all there. At 400 ft. where the veins have been cut they are larger than near the surface and just as rich in copper. Mr. Probert paid a compliment to the management of the mines by Patrick Wall, general manager of the company and one of the most experienced mining men in Butte, and to the business management of the company's affairs by Mr. F. M. Sullivan. W. A. Paine, one of the principal stockholders of the East Butte, purchased 10,000 shares of the treasury stock at the market price, and the money will be employed to carry out plans of betterment and to pay for a large tract of land which the company acquired sometime ago, and which Mr. Probert considers a good investment, as in his opinion some of Butte's biggest copper veins will be found in that portion of the district. The lessees in the East Butte mines in November paid about $12,000 in royalties, that being $4,000 more than they paid the month previous.

The Anaconda Co., which is operating the Gallatin and J. I. C. shafts just west of the East Butte, has secured from the District Court an injunction to prevent the owners of the May quartz claim from mining in that ground pending a final determination of the controversy between placer and lode titles. The Anaconda Co. owns under a placer location and patent and has been mining the quartz for some time, the contention being that the quartz was not known to exist in the ground until after the issuance of the placer patent. The owners and locators of the May have contended that the quartz veins were known at the time the placer was located and that therefore the veins are excluded from the placer patent. The District Court, on the preliminary hearing, held in favor of the Anaconda Co. The latter mines about 400 tons of ore per day from the two shafts. The owners of the May also did some mining on an adjoining piece of ground until they were stopped by the injunction.

The Reins Copper Co. has purchased the Ella Mining Co.'s property, a fractional claim lying north of and adjoining the Combination mine, which the Reins Co. is exploring. Colonel Guffy, of Pittsburgh, has been the principal financial backer of the Reins Co. and has put several big fortunes into the ground in an effort to find the eastern extension of the big Leonard vein of the Boston & Montana. He has paid $240,000 more for the Ella. A cross-cut run north from the 1,200-ft. station of the Combination has about reached the Ella south sideline, and will now be continued into the Ella ground, and perhaps through it. There is a shaft 800 ft. deep on the Ella, and some years ago a considerable quantity of silver ore was mined from it.

The Alliance Copper Co. has cut an 8-ft. vein of copper ore 50 ft. east of the shaft at a depth of 200 ft.; it carries 10.8% copper, and 82 oz. silver per ton. It is claimed that three feet of the vein will average 20% copper. The shaft on the Alliance ground was sunk jointly by the Alliance and Farrell copper companies, their territory adjoining. The vein cut in the Alliance ground goes through the Farrell also. This is in the southeastern portion of the Butte district, and west of the East Butte mines.——The shaft of the Colusa-Leonard Extension Co. has reached a depth of 75 ft., but work on it has been stopped pending the installation of a new engine and boilers, which are now being placed. ——The face of the cross-cut which the Original Co. is driving south from the 1,800-ft. station for the Davis-Daly Estates Co.,

is in more than 1,000 ft., but so far only a few stringers of ore have been encountered. The company expects, however, to cut a larger vein with a further distance of about 100 ft. Work at the other mines of the company is progressing satisfactorily, but no ore in commercial quantities has been found in any of them.

Butte men are interested in a new company operating in the Mullan district in Idaho, called the Boulder Creek Mining Co. Its principal claim is the Central, situated less than a mile from the town of Mullan. Two adits are being driven as drifts on the vein. One adit is 400 ft. long and in ore to the face. The other adit is also in ore and 140 ft. long. Ore taken out in running the adits assays from 10 to 50% lead, and carries some silver and copper. W. F. Edwards, a mining expert who examined the property, says "it is the best prospect known in the Coeur d'Alene mining region." —— Reports from the mine of the Butte & Arizona Co., in Arizona, continue to arouse enthusiasm among the officers and stockholders in Butte. W. W. Adams, who has just returned from the mine, says the adit is progressing rapidly, and the face of the opening is going toward the immense surface croppings, and will be reached in another 200 ft. Each foot of adit gives a foot in depth. The adit is on a vein and there is ore all the way. Cross-cuts are being driven on both sides of the adit. In the opinion of Mr. Adams, the mine will develop into an immense copper producer.

Toronto, Canada.

November Shipments.—The Nipissing Affair.—The Question of Titles.—Necessity for Better Security.—Phenomenal Ore in the Right of Way.—Reclaiming a Lake.—Other Strikes.—The Laurentian Mine.—Discoveries of Iron Deposits.

Shipments of Cobalt ore over the Temiskaming & Northern Ontario Railway for the month of November amounted to upward of 724 tons, as compared with 1,120 tons for October. The amount shipped from each mine was as follows, fractions being omitted:

La Rose	247 tons
Buffalo	140 "
Conlagas	120 "
Nipissing	99 "
Trethewey	53 "
Foster	23 "
Nova Scotia	23 "
Green-Meehan	17 "

The flurry in Nipissing and other Cobalt stocks during the earlier part of the week caused by the refusal of the Guggenheims of New York to complete the deal for the purchase of 400,000 shares of Nipissing stock, on the ground that they had been refused sufficient time to make enquiry into the title, rumors as to the insecurity of which had been afloat, has brought the question as to the validity of mining titles prominently forward. As far as the Nipissing properties are concerned, J. J. Foy, Provisional Attorney General, has made an official statement that he was not aware of any protest having been presented to the Government as to the company's title or any intended application for a fiat to permit a suit to be entered. This is well enough as far as it goes, but at the same time it is hardly the absolute security naturally required in a deal involving ten million dollars. The fact is that the situation as regards stability of titles generally is in condition far from satisfactory to the large investor. There is any amount of litigation now pending in connection with Cobalt properties. As the law now stands after the title has passed from the Crown, anyone seeking to impugn it or set up a counter-claim on the ground of fraud or misrepresentation must first obtain a fiat—that is, the consent of the Attorney General to bring an action. This practically places at the mercy of the Government many of the mining enterprises of Cobalt, especially those whose title dates back to the earlier days of the camp, when there was much irregularity and not a little downright fraud in making locations. Last summer the White Silver Mining Co. had their leases, covering about 120 acres, canceled, on the ground of fraudulent affidavits of discovery by the locators, and quite recently the owners of the O'Brien mine, after protracted litigation, were glad to secure their title by undertaking to pay a 25% royalty to the Government on their output. With these instances before them, it is hardly a matter for surprise that shrewd investors should hesitate before placing themselves in a position to be held up either by possible claimants or by the Provincial Government. Mining men are loud in their demands for some change by which an indefeasible title can be secured, which will be more satisfactory, to outsiders at least, than a cabinet minister's bland assurance that so far as he knows, no one is assailing it. The question is likely to have a prominent place during the coming session of the Provincial Legislature.

At the Right of Way mine, Cobalt, on December 1,



Map of Part of British Columbia.

seven men with drills and shovels took out about four tons of ore running from 2,000 to 6,000 oz. silver per ton and valued at over $8,000. The work was done on the continuation of the Timmins vein.——The Peterson Lake Co. has almost completed the lowering of the outlet of the lake, which will reduce the level about 15 ft. and reclaim some 50 acres of the bed. The company is now sinking a shaft at the water's edge on the continuation of the Nova Scotia mine vein.——A find of native silver has been made on the Gillies Silver Mining Co.'s property. This is not the Gillies Limit Government mine. ——At the Morrison mine a vein two feet wide has been uncovered. A shaft 10 ft. deep has been sunk showing ore rich in cobalt.——Stripping to the extent of 2,000 ft. has been done at the Green-Meehan mine.——Edward C. Davis and George L. Walker, both of Boston, and representing large financial interests, were among recent visitors to the Cobalt camp.——Last week a visit of inspection to the Laurentian gold mine in the Manitou Lake district was paid by a party of prominent mining men and financiers, including Anthony Blum, principal owner of the mine, of Boston, Hugo Von Hagen, John H. Banks, G. A. Vigouroux, and M. E. Downs, of New York, and Prof. F. Hille, of Port Arthur, Ontario.

A find of magnetite iron ore has been made in Wisner

township, which immediately adjoins Hutton township, in which the Moose Mountain iron ore deposits, now being tapped by the extension of the Canadian Northern Ontario Railway are located. It is regarded as probably an extension of the Moose Mountain formation.——The iron ore deposit at L'Amable in the Hastings county mineral region has been tested by diamond drilling and found to be 150 ft. deep.

H. P. Bell, a British Columbia engineer, has submitted a report to the Canadian Department of Railways & Canals as to the feasibility and cost of building a bridge from the British Columbia mainland to Vancouver Island. He says that the work would be of a formidable character and would cost at least $35,000,000. By taking advantage of the Valdes islands the distance could be spanned by seven bridges of about 1,200 ft. each, but the channels are of immense depth and the tides rapid, and the islands being rocky, would prove difficult for railway laying. The bridges would have to be 150 ft. above the sea-level. The report is regarded as conclusive against any such undertaking for many years to come.

A new silver field has been discovered as the result of active prospecting in the Laurentian range, tributary to Montreal. The deposit consists of silver, galena, and lead, the silver, according to report, assaying high. The statement as to discoveries having been made, exciting widespread interest in the locality, is confirmed by L. O. Armstrong, colonization agent of the Canadian Pacific Railway, who has just returned from the district.

Salt Lake City, Utah.

Numerous Arrests at Instance of Government.—Coal Lands Enquiry.—Newhouse and Heinze Active.—Daly-Judge Declares Dividend.—Shipments From Tintic.—Local Stock Sales.

Somewhat of a sensation was sprung by the Federal grand jury last week by bringing indictments against several persons more or less prominent in railroad and coal-mining affairs, the action taken being the result of the investigation conducted recently in this City by the Interstate Commerce Commission. Everet Buckingham, general superintendent of the Oregon Short Line railroad, the Union Pacific Coal, Union Pacific, and Oregon Short Line railroad companies are charged with violations of the Interstate Commerce law and one instance of this is cited in the case of D. J. Sharp, a former well-known coal-dealer of Salt Lake. Because Mr. Sharp chose to sell fuel to his customers during the past summer at 25 cents under the usual rate—notwithstanding that the railroads had granted dealers a 25-cent cut in summer rates, he was refused more coal and was forced to retire from business. H. G. Williams, general manager of the Utah Fuel Co., James M. Moore, general Western sales agent of the Union Pacific Coal Co.; Robert Forrester, geologist and agent of the Utah Fuel Co.; William D. Foster, chief clerk in the office of Mr. Forrester; Elroy M. Clark, a Denver attorney for the Utah Fuel Co.; Alexander H. Cowie, chief clerk in the office of the vice-president of the Utah Fuel Co.; George A. Moore to secure dummies to locate land for the Utah Fuel Co., and the Utah Fuel Co. are charged with the crime of conspiracy to defraud the United States Government in unlawfully obtaining title to coal-lands; while Thomas A. Moore and Theo. Schulte must stand trial for perjury in the Utah Fuel land cases. Nearly all the defendants have been arrested and are out on bonds awaiting trial before Judge Marshall of the United States Circuit Court, in April next. It has been charged by agents of the Government that some of the best mines operated by the Utah Fuel Co. are located on lands obtained through fraud.

Samuel Newhouse has acquired a large interest in the property of the Ohio Kentucky Mining Co., at Pioche, Nev., and has been elected president of that corporation. ——The taking over of a control of the Ohio Copper mine in Bingham by F. Augustus Heinze means the building of a mill for that property in the near future. Already, W. A. Kidney, metallurgist in the employ of Mr. Heinze, is working on the proposition. It is believed that a plant with capacity for the treatment of at least 2,000 tons of ore per day will be built.

The directors of the Daly-Judge Mining Co., of Park City, are scheduled to meet in a few days for the purpose of giving consideration to the posting of the initial dividend of that company, which will probably be a quarterly distribution of 45c. per share, or $135,000.——A strike of considerable importance has been reported in the Odin mine at Park City. The find was made in the main adit at a distance of about 1,000 ft. from the portal. ——The Nelson-Queen is a new shipping mine in the Elkhorn district, near Park City. Ore brought to the Salt Lake market last week netted $45 per ton.

It has been announced that the breaking of ground for the new smelter of the Tintic Smelting Co., will begin soon after the first of the year.——The ore shipments from the Tintic mining district last month amounted to 154 carloads, the contributing mines and amounts being: Ajax, 3; Beck Tunnel, 10; Black Jack, 2; Bullion Beck, 11; Carisa 8; Centennial Eureka, 37; Eagle & Blue Bell, 8; Eureka Hill, 7; Gemini, 5; Godiva, 2; Grand Central 10; Mammoth, 18; May Day, 2; Scranton, 6; Tintic Iron, 14; Uncle Sam, 6; Victoria, 1; Yankee Con., 5 carloads.——Last week's sales on the floor of the Salt Lake Stock & Mining Exchange amounted to the transfer of 222,943 shares of stocks for $220,495.

Bisbee, Arizona.

An Important Discovery in the Denn-Arizona Mine.

By Telegraph.—One of the most encouraging strikes ever made in this region was made on the property of the Denn-Arizona Mining Co., situated in the Warren mining district, yesterday, and at the present time it has



Arizona and Northern Sonora.

reached a stage of development where it is safe to say that a permanent orebody has been found. The great significance in the finding of this orebody in the Denn-Arizona ground lies in the fact that up to a short time ago most prominent mining authorities who have ever

visited Bisbee and the surrounding country have stated that copper ore would never be found north of the cañon where the town is situated, and an imaginary line called the Dividend fault has hitherto been regarded as the boundary for all big producers. The Denn-Arizona Co. was organized a little over a year ago, and against the advice of many authorities work has been steadily prosecuted. The property comprises 13 claims, and lies immediately north of the Junction property, which was lately absorbent by the Cole interests. At the present time the shaft on the Denn-Arizona property has been sunk to a depth of 1,100 ft., and at the 1,100-ft. level a drift was started; when the drift had been opened up for about 600 ft., the management decided to run a cross-cut to diamond-drill bore, and accordingly turned south. Yesterday morning the cross-cut had been driven 223 ft., when a round of shots opened up full face of 6% oxide and carbonate ore. At present the cross-cut has been driven through 14 ft. of ore and at every round of shots the average percentage of copper has increased. The management states that the sample assayed went a fraction over 28% in copper, and estimated that the ore would average 12% at least. The importance of this strike to the Warren district can be realized to some extent when one knows that hundreds of claims have been located north of the Dividend fault, and have not been developed because everyone was awaiting the outcome of the Denn-Arizona Co.'s explorations. The Cochise Development Co., the Warren Realty & Development Co., and the American Saginaw Co. have been also doing extensive development work north of the Dividend fault, but up to the present time they have found no permanent orebody, although well-grounded rumors state that a large body of high-grade ore was penetrated by the diamond drill on the Warren property, but the management will not give any statement in regard to this matter. The find at the Denn-Arizona has worked the stock up 12 points and higher prices are expected.

Goldfield, Nevada.

Many Rich Strikes.—The New Camp at Wonder.—Excellent Discoveries.—Improved Prospects at Manhattan.—Lot-Jumping at Goldfield.

Goldfield holds the centre of the stage at the present time, but while many rich strikes are being made, establishing this camp as one of the greatest in the world, the smaller camps are trying to develop another such goldfield, and with prospects of success. Among the more prominent outside mining camps is Wonder, situated but a short distance from Fairview. Many rich strikes have been made, and everyone visiting the locality returns with the tidings that Wonder will surely make another Goldfield. On the Nevada Wonder, the original discovery, ore is being taken that will assay better than $600 per ton in gold clear across a 12-ft. vein. On the 150-ft. level ore is being taken that assays $10,000 per ton. Shipping ore of great value, is being sacked as fast as men and money can take it from the ground, and no sorting is done. On the Mae Wonder property, lying between the Nevada Wonder and Joe Wonder, a large vein has been uncovered, returning assays better than $200 per ton in gold. This rich deposit was broken into in doing the location work on the property, the vein not being exposed at the surface. On the Lucky Joe and Arthur R. claims of the Joe Wonder Mining Co., three or four veins have been opened, giving assays from $50 to $200 per ton, and development work is being pushed with great rapidity. The rich vein of the Nevada Wonder trends toward and through this property, and the management is hard at work opening up its rich veins. The showing to date is exceptionally flattering. Again, on the Daisy Wonder, rich ore has been disclosed, and, in fact, no less than 30 properties in the district are shipping ore. The ore is strictly free milling, and some of the finest specimens ever seen in the State were taken from the workings at Wonder.

Some excellent strikes in the Manhattan district have caused a stir in mining circles at that point. The finding of rich ore on the 200-ft. level of the Manhattan Consolidated, coupled with the strikes on the Independence, Paymaster, Giant, Original Manhattan, and Manhattan Nevada, has started all local stocks on the upward path, and it is predicted that a great boom will strike Manhattan before spring. The Manhattan Consolidated has 30 ft. of ore that will run better than $40 per ton, while about two and one-half feet will assay over $300. At a distance of 270 ft. in the tunnel on the Georgey group of the Manhattan Nevada Gold Mines Co. at Central, a regular vein has been encountered, which is 14 ft. between walls, and assaying better than $10. This vein is strong, cutting the formation at right angles, and carrying every indication of permanency. It is the intention of the management to drive on it as well as to sink a winze to explore the ground and look for a high-grade orebody, as the character of the mineral is identical with that of the Consolidated, and the assays are even higher than those of the Consolidated when ore was first struck. In addition, this company is running a cross-cut from the bottom of an 80-ft. shaft, and the face is all in ore of good milling grade. East Manhattan is excited over an offer of a large amount, made by an Eastern syndicate, for the control of the Toquima Copper Co., the Bonanza Copper Co., and the Ralston Valley Gold & Copper Co. These three companies are forging to the front, and have large bodies of high-grade copper ore blocked out.

A misconstruction of a Federal Land Office decision is apparently responsible for an epidemic of lot-jumping at Goldfield, a sporadic outbreak of that instinct for plunder latent among the riff-raff of every camp. Phenix, a thrifty individual, not the thriving Arizona city, located ground between Goldfield and Columbia a few years ago as a placer. He then platted the land, and sold lots for building purposes. Squatters settled upon the tract, and the differences between Phenix and these other enterprising persons were taken into court, the Land Department being finally petitioned through the District Court to enter the land as a townsite, upon the assertion that the location was not being used for placer mining, but for real estate speculation. According to rumor the Court is about to receive instructions to enter the application of the squatters, and prepare to complete the procedure of establishing a townsite upon the land in dispute. The publication of this alleged action on the part of the Interior Department was a signal for a general campaign of lot-jumping, not only upon what remained vacant of the Phenix Addition, but also well within the business quarter of Goldfield, many of the most valuable lots in town being jumped, and signs erected claiming squatters' rights, under the delusion, presumably, that the Government order embraced all placer ground in the district, including the Goldfield placer upon which the main portion of the town is situated. The fact that a consideration has passed in the transfer of every lot in the Goldfield townsite, and that much of this real estate has changed hands a number of times at enhanced figures, had no deterrent effect upon this form of "enterprise without outlay." While there is probably no reason for anxiety on the part of those owning improved property at Goldfield, the fair name and future welfare of the camp require that those who have come into the district and invested their money in good faith, be protected and insured peaceable possession of their property.

Mining Summary.

ARIZONA.

YAVAPAI COUNTY.

The Wildflower group in the Pine Grove district has been sold by F. M. Murphy to the Yavapai-Gold-Silver-Copper Consolidated Co., the purchase price being unstated. The group consists of thirty claims, 13 being held under U. S. patent, the other 17 being held and developed under right of location. The property includes the Old Reliable mine, which has been worked from time to time since 1875, its ores yielding by the arastra process over $100 per ton. The vein of this mine follows a syenite and porphyry contact, and is developed by several hundred feet of cross-cutting. The other claims of the Wildflower group are opened up by several thousand feet of adits, shafts, and underground workings, exposing large bodies of ore. Besides mineral rights the locations cover water privileges ensuring sufficient power for a reduction plant which will be erected later. Preliminary to starting extensive operations the company will put a force of men to work building a road from the Crown King terminus of the Bradshaw Mtn. R. R. to the camp, a distance of three miles, over which the new machinery will be hauled. Houses are in course of erection for the accommodation of miners and engineers. The company is also the owner of the Tiger group about six miles further west, in the Bradshaw Mtn., and the adjacent California and Boston properties, all being developed by a large force of men with satisfactory results.——The recently organized Verde-Grande Copper Co. has decided to vigorously prosecute work upon its holdings on the south slope of Smelter hill and adjoining the United Verde mine. A wagon-road and the necessary houses will be built at once, and a double-compertment shaft started with a view to going down after the orebody expeditiously.——A little over a mile southerly from the Verde-Grande, the Pittsburgh-Jerome Co. has its shaft down about 400 ft., and the bottom of the shaft is heavily copper-stained material of a slaty character. Pay-ore was encountered at the 255 and 358-ft. levels. At the last named, the shaft entered and passed through 12 ft. of pay sulphide ore.——Two carloads of ore carrying good values in copper and gold are on the dump at the Little Daisy mine, ready for shipment to the Humboldt smelter. This property is situated in the Mineral Point district, which embraces a stretch of country along the foothills of the Black Hill range from the mouth of Yeager cañon to the headwaters of the Verde river at Del Rio. The Little Daisy has its shaft down 90 ft., exposing a five-foot pay-streak at the bottom.

CALIFORNIA.

AMADOR COUNTY.

A rich strike has been made at the Fremont mine, near Amador City, a large vein of high-grade ore having been exposed last week in firing a blast. Guards were placed in charge of the mine to prevent the ore being stolen on its arrival at the surface, free gold occurring in sufficient quantities to make this precaution necessary. It is estimated that over $50,000 has been taken out of the mine during the past seven days.

INYO COUNTY.

A rush has set in to a new goldfield in the Sierra Nevada mountains, seven miles south of Olancha. The camp is hidden away in a cañon that opens upon the desert 79 miles from Mohave, 19 miles from Keeler, and seven miles from Hawaii Meadows. The nearest railroad is at Keeler, the terminal of the Nevada & California narrow gauge. Entrance to the cañon is by a wagon-trail already worn from Olancha. There is an abundance of water and timber. On a ridge to the south is the Gilt Edge claim, the original discovery made by W. E. Higgins and partners. The ore contains petzite, a telluride consisting of two parts gold, two parts silver, and one part tellurium. From the last-named metal the new camp derives its name in common with the famous Colorado mining centre, 'Telluride.' A 15-ft. shaft on the Gilt Edge cut a vein 16 in. wide, the ore running from $180 to $250.

SISKIYOU COUNTY.

An important deal was recently made in western Siskiyou by which Henry E. Wood, of Denver, acting in behalf of Colorado capital, has purchased the interest of A. C. Brokaw in the Advance group of claims in China Gulch, Salmon River district. This is the most important deal in the history of western Siskiyou. It is believed that the new owners will secure the entire China Gulch basin, at a cost of many thousand dollars, and will then arrange to operate the properties on an extensive scale. Development work will be kept going upon the Advance mines constantly, and as soon as machinery can be placed upon the ground in the spring, a large aerial bucket tramway over a mile long will be erected for handling the ore from the mine to the mill. An electric power plant, machine-drills, and other improvements will be installed at the mine, together with additional stamps. The mine has never looked better, the lode averaging over eight feet wide, and the payshoot prospecting for over a thousand feet. The property has not yet been developed to a greater depth than 100 ft. A mill test upon 1,500 tons has been run since the mill was erected this summer, the ore averaging $40 per ton.

TRINITY COUNTY.

W. R. Beall and W. R. Bigelow have secured a bond on the old Indian Creek Co.'s placer and quartz properties in the Indian Creek mining district, near Weaverville. These properties were purchased by Dr. D. B. Fields about a year ago. The placers have been steadily worked with good results, returning last season $2,200 per acre, at an expense of $800 per acre. The water right appurtenant to the mine is one of the best in the county. The quartz claims adjoin the placer upon the opposite side of the creek, and are eleven in number. The lode runs east and west, and dips into the mountain at an angle of 35°. It varies from 3½ to 12 ft. wide, with 2% sulphides. There are 1,500 tons of ore on the dump averaging $6 to $8 per ton.——The power plant for the Bullychoop mine, near Weaverville, has been finished, and its mill will soon be dropping 30 stamps on ore that has been accumulating during the erection of the mill. The company has one of the best equipped plants in the county. In a lode of low-grade ore going $4 per ton, a rich streak occurs, four feet wide, and assaying $60 per ton. With the improvements recently installed, ore can be mined and milled for less than a dollar per ton. The mine will be operated all winter with a force of about 100 men.

TUOLUMNE COUNTY.

(Special Correspondence).—There will soon be great activity in the Nonpareil mine, with A. P. Dron as superintendent and H. M. Stanley as foreman. It is reported that a mill will be erected and a compressor installed.——Operations are to be resumed at the Cosmopolite with a large force of men.—Driving north and south from the cross-cut is going on at the Yorktown mine, on the Klein ranch, near Stent, and ore of the same high grade as that found when the recent strike was first made, is being taken out.——Development work continues on the North Star, near Tuolumne, with good results, and it is expected sufficient good ore will be available within a few more weeks to warrant starting up the mill, which will first be thoroughly repaired.

Tuolumne Dec. 10.

COLORADO.

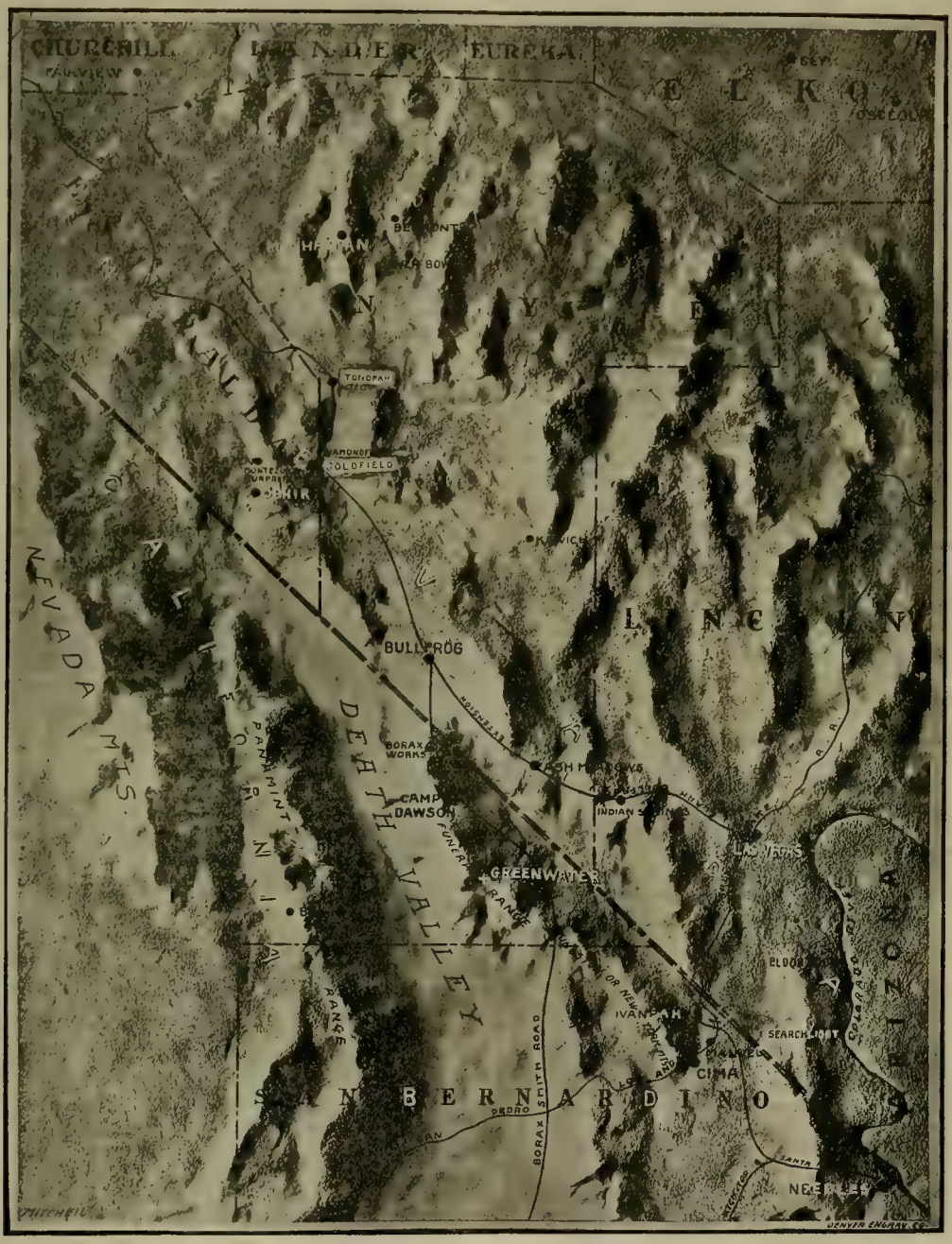
CLEAR CREEK COUNTY.

(Special Correspondence).—Rees C. Vidler, president of the Transcontinental Tunnel & Transportation Co., left for London, England, last week for the purpose of financing the purchase of the Waldorf Co.'s mines, near Georgetown, and the Argentine Central railroad, both at present controlled by E. J. Wilcox. The price is said to be $3,000,000.——S. A. Leebrick, of Idaho Springs, has purchased the British & Victoria group of six claims on Griffith Mtn., for $5,000 from Rudolph Barth. This property adjoins the Magnet & Sequel group, which are believed to be located on the Lamartine lode.——The Buckeye Co. has secured the Claypool tunnel, on Columbia Mtn., which it will drive 5,000 ft. The adit is now in 750 ft., having cut two lodes from which $100 ore has been shipped in the past. The enterprise is backed by Denver, New York, and Cincinnati people.——Joe Raymond has encountered ore which assays $50

per ton in the Paris lode, which was cut by the Raymond adit 500 ft. from the entrance. The Raymond group consists of seven patented claims on Griffith Mtn. The same lode was cut in the Capitol adit at 1,000 ft. below surface, where it showed considerable mineral in a well-defined vein. The Capitol Mining Co. is now shipping carload lots of concentrating ore to be tested preparatory to erecting its own mill.

SAN MIGUEL COUNTY.

The Black Bear mill situated at the head of Ingram falls, three miles from Telluride, has been completed and will start to treat ore from the Cascade group. This plant is one of the most completely equipped in the county, and was constructed for the treatment of Black Bear ore, but it is not likely to be running on that before next spring. A test-run



Relief Map of the Nevada-California Border.

A strike of rich ore has been made in the Cliff mine on Columbia Mtn., in the raise from the lower levels. The property was purchased this year by Dr. Bell, of Minneapolis. The mine has produced large quantities of high-grade ore in the past.——The Golden Glory Co. has acquired the Colorado Tunnel property. The main adit, which is in 500 ft., will be driven ahead, and machinery installed for power drills.

Georgetown, Dec. 7.

of a large quantity of Cascade ore was made by the Black Bear Co. before the transfer, which yielded satisfactory values in gold and silver, gold predominating. The vein is from three to six feet wide, composed of white and brown quartz, the gold being largely free milling.

SUMMIT COUNTY.

(Special Correspondence).—The Country Boy is again shipping high-grade zinc ore, which averages 50%, in carload lots. The company has lately installed an electric

hoist to raise the ore from the 90-ft. winze which is now being deepened below the tunnel level. The pay-streak is about 3 ft. wide and the ore is taken out without blasting, being simply shoveled into cars and sent direct to the smelter. A drift has been run to the west where the winze was started and another rich shoot of zinc ore was encountered. The first shoot has been producing rich ore at the rate of 500 tons per month.——The Blue Flag Gold Mining Co. has remodeled its stamp and concentrating mill on Bald Mtn., above Illinois gulch. The new mill has been started and is turning out a good grade of concentrate. Its orebodies are large and of first-class concentrating material, being made up of lead, zinc, and iron sulphides, carrying gold and silver, and the mine is already opened up by a main tunnel and several thousand feet of drifts along the lodes. This property includes the Laurium group and other adjacent property. Robert Niles is superintendent.——The Gold Dust Mines Co., operating the Gold Dust and Puzzle groups, has taken a lease on the old West Side mill in the town of Breckenridge, and is now thoroughly overhauling the mill and renovating it for a steady run on their concentrating ores. For the past two years this company has been shipping high-grade ore direct to the smelter and they have accumulated a large reserve of second-grade ore which needs concentrating locally to make a profit on the ore. By the addition of Hartz jigs and Wilfley tables to the old mill, the plant will be fairly complete and will be able to handle close to 100 tons per day, making good zinc and lead products. James F. Callbreath, secretary of the American Mining Congress, is manager of this property.——The French Creek Co. is making arrangements for the resuming of operations in their large adit in Bald Mtn. This adit is now in over 2,300 ft., and has passed through several veins. It is the intention of the management to do some prospecting by driving along these veins. This project is backed by a syndicate of Colorado Springs capitalists who have other properties in this district.——The management of the Wellington property has just made a contract with a zinc smelter company to handle from 50 to 75 tons per day of high-grade zinc ore; contract to last for a few months until such time as their own concentrating mill is completed and ready for work.——At Montezuma the Fisherman mine has made a new strike of concentrating ore which is being shipped to the Lenawee Tunnel & Reduction Co. The orebody was encountered 800 ft. in from the mouth of the main tunnel and averages four feet in width.——The New Pennsylvania Mines Co. has just completed a big shipment of heavy silver-lead concentrates from their own mill.——The Excelsior mine is being worked again and a new contract has been let for driving the drift from the first level, a distance of 500 ft. This property has of late been closed down on several occasions.

Breckenridge, Dec. 8.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—The Quartette Mining Co. is operating on two of their 27 claims in the Searchlight district. The main working shaft is on the Copper King claim, and has reached a depth of 1,000 ft., on an incline varying from 34° near the surface to 70° in the lower levels The vein varies in width from 10 to 40 ft., and from the 400-ft. level down it is over 30 ft. wide, with the ore increasing, the largest and richest vein being encountered at the lowest level. The mine is equipped with a 20-stamp mill, which has a regular capacity of four tons per stamp. The ore averages between $40 and $50 per ton, of which 85% is recovered by amalgamation. The company has been paying dividends of 1% for over three years, and has recently increased to 1½%, with every prospect of an increase to 3% at an early date. Sufficient water for milling and other purposes is obtained from the mine, and a notable feature of this property, as in the Searchlight field generally, is the great depth in which free gold prevails. With the exception of an ore-shoot between the 7th and 8th levels, which carries a large percentage of base ore in the form of sulphide, valued at about $150 per ton, the whole body of ore so far developed in the Quartette mine is free milling.—— Two miles northwesterly from the Quartette, the Searchlight Mining & Milling Co. owns six mineral claims, which were taken over by the company about two years ago from the original locators, O. B. Landon and A. B. Day.

LYON COUNTY.

A new camp has been established on what was reservation ground, 16 miles southeast of Yerington, and named Copper Run. A large number of gold, silver, copper, and lead veins have already been located, and 16 placer claims have been taken up for a townsite. There is a fine spring of water in the vicinity, with plenty of wood and timber adjacent for mining purposes. The town is situated about half a mile west of one of the largest copper lodes in this State, and about four miles south of some old workings on this lode, the vein being traceable for over seven miles. Good prospects have been taken at various points, going anywhere from 10 to 60% copper and $8 to $25 gold, and up to 60 oz. silver.

WHITE PINE COUNTY.

Copper ore has been struck in the McDonald-Ely shaft at a depth of 75 ft., and the showing on this vein has stimulated prospecting the north of Robinson cañon, G. L. Rickard having purchased the Christmas group of mines (which adjoins the McDonald-Ely holdings) on the strength of the recent strike. F. Augustus Heinze is said to have acquired interest in this district.——Gold float has been found on the outskirts of Ely assaying $200 per ton. Much of the ground on which this float was found has already been taken up for copper. A number of prospectors are making an effort to trace the vein.

NEW MEXICO.

DONNA ANA COUNTY.

A rich vein of covellite or indigo copper ore has been recently opened up on the first level of the Lucky mine, near Orogrande. The lode is 10 ft. wide and carries from 20 to 40% copper per ton; it shows 30 ft. down in the winze, and there remains 200 ft. of virgin ground to be opened up.—— The Monte Carlo group of gold and copper claims north of Orogrande have been sold to a company recently launched as the Monte Carlo Consolidated Copper Co. The previous owners, Messrs. Culver & Downs, located the group, about ten years ago, after a long search for the original claim located nearly a quarter of a century ago by prospectors who were driven off by Apache Indians, torrential storms afterward obliterating all trace of the shaft. The property now comprises 180 acres of contiguous territory, developed by three shafts each 70 ft. deep, besides trenches and open-cuts. The ore assays from 17 to 35% copper, from 136 to 800 oz. silver, and carries about $4 gold per ton.

OREGON.

BAKER COUNTY.

The group of claims acquired by the Success Gold Mining Co., in the Cracker Creek district, about one mile south of Hanover, is making a good showing. At surface one vein is from 10 to 20 ft. wide, the assays from which have ranged from $5 to $200. W. T. Woodford is in charge.

GRANT COUNTY.

Large shipments of high-grade ore have been made to the Sumpter smelter during the past few weeks from the Buffalo group, about five miles north of Granite. The ore runs from $80 to $100 per ton. The mine is being operated by W. T. Kendall and Thos. Daringer, under a sub-lease from W. Elmer, who in turn has a lease from the Buffalo-Monitor Mining Co. In the early history of the mine more than $1,000 per week was cleaned up by the discoverers, who worked the free-milling ore in an arastra.——Development work on the Ben Harrison group is giving good returns. The main vein has been opened on the surface by cuts and is now known to be continuous for the length of four claims. A shaft was sunk 35 ft. on the hanging wall, and from the bottom a cross-cut was driven to the opposite wall, proving a width of 14 ft. Samples taken gave the following results: $13.17, $13.60, $15.57, and $7.50, making an average of $12.36 per ton for the entire width of 14 feet.

Extensive changes and improvements are being made by the Steuben Placer Co., operating the Thornberg placers at North Fork about ten miles from Granite. The present

ditch and flume will be increased from 18 in. to three feet deep, and the pipe-head raised to about 400 ft. instead of 120 ft., by extending the high flume about a mile. For this purpose a contract will be let for cutting 200,000 ft. of logs. The company owns 400 acres of placer land along the banks of the North Fork river. Work is carried on in the pits night and day throughout the summer. Experiments are being made on the black sand, which usually carries off the fine gold and other minerals of value.

LANE COUNTY.

A big ore-crushing house is being built at the Black Butte quicksilver mines. The mill, at the highest point, will be 103 ft. from the ground, and a trestle will run from the 400-ft. adit direct to the top of the building. The management hopes to get the actual production of commercial mercury started and on the market in three months.

WASHINGTON.

FERRY COUNTY.

(Special Correspondence).—The Monitor group, consisting of the Ironsides, Treadwell, Monitor, Red Chief, and Red Cloud claims, situated on Missouri Mtn., 12 miles northeast of Republic, has been sold by Z. C. and J. I. Perkins to E. R. Fraser of Spokane, Wash., for $15,000, of which $3,000 was paid in cash. An agreement calls for the payment of $2,000 in 90 days, $5,000 in nine months, and $5,000 in 15 months, the purchasers to employ not less than four men continuously during the life of the lease. Quartz and iron croppings are traceable the entire length of the group, from 20 to 100 ft. wide. Considerable surface prospecting has been done, and a month ago a body of ore was struck that assayed $36 in copper and gold.——The Belcher Mtn. R. R. is in full operation, and has begun grading for two miles for a ground tramway from the No. 2 adit of the Belcher mine to the Oversight group. Two new ore-bins have been built at the Oversight mine, and ore is being shipped continuously from the No. 1 and 2 adits. An incline shaft has been sunk 30 ft. deep, on a small vein of soft oxidized ore, on the Pin Money claim of the Oversight group. The ore contains gold, silver, and copper, while cobalt in the form of smaltite occurs in nodules.——The Bortle Copper-Gold Co. which owns the Gold King, Alpha, and Omega, a group of claims adjoining the Belcher mine on the north, has sunk a 52 ft. shaft near the dividing line of the two properties. A sample from the bottom assayed $22 per ton in gold, silver, and copper.——R. A. and L. P. Farr have bonded the Manila, South Manila, Cavite, and Manila Fraction claims, lying four miles southwest of Keller, to J. L. Harper and associates for $40,000, the Farrs acting in the interests of the Manila Co. A cash payment of $5,000 is said to have been made. Mr. Harper took a bond for the purchase of this property over two years ago, and let it expire after making a first payment.

Republic, Dec. 8.

MEXICO.

The Black Mountain Mining Co., of Cerro Prieto, Sonora, Mex., is contemplating the addition of 120 additional stamps, thus doubling the existing plant. The mine is looking well and has large reserves of ore. Noble C. Banks is manager with F. M. Cox as superintendent.

AGUASCALIENTES.

A number of tin discoveries have been made near Aguascalientes. These recent finds are said to run close to 10% pure metal. Lack of facilities for transport and smelting have hitherto handicapped this district. The fact that the properties of Messrs. Pratt and Rettick are reported to have been sold to the Mitchell Mining Co. of New York is believed to open up the prospect of additional smelting facilities for properties in the States of Aguascalientes and Jalisco.

CHIHUAHUA.

A telephone line, 100 miles long, is being built to connect the Dolores mine with the San Isidro station on the Temosachic branch of the Chihuahua & Pacific.——It is stated that about 500 men are at present employed on the Greene Gold-Silver Co. mines in the Sierra Madre country.——The plant of the Llanos de Oro Mining & Milling Co. has been shut down indefinitely.

The Parcionera mine, in the Santa Eulalia district is shipping about 25 tons of 30 to 50 oz. silver ore daily.——A new strike of high-grade ore is reported in the Buena Tierra mine. It is believed to be a large body.——Copper ore is being shipped from El Tajo mine to the Torreon smelter. This is a new find, and work on this mine, the property of the American Zinc Extraction Co., is being pushed.

GUANAJUATO.

More mills are being built and new companies are being floated. The 120-stamp mill of the Peregrina is near completion; 60 to 80 stamps have been dropping for some time and the remainder will be ready shortly, if not held up by the delay in receiving cyanide machinery. The Guanajuato Reduction and Mines Co. is adding another 80 stamps, making 160 altogether, with the necessary cyanide equipment to correspond. The Amalgamated Mines Co. at La Luz, of which the gambler Al. Adams, of New York, was the leading spirit, will have 100 stamps and cyanide plant ready in about six weeks. The San Prospero Co. will have its 40-stamp mill and cyanide plant ready in sixty days. The Republic Mines Co. was recently organized to take over the Barragana group, which adjoins the Peregrina, and which has a northerly extension of all the veins traversing the Peregrina properties. In addition, the company will own the Cardonas and La Union groups, which contain within their limits about 4,000 ft. of the south end of the Vetra Madre. All these properties have been worked to some extent in the past, but the Mexican owners have held them without doing anything except gophering on the surface. There is a good prospect of a big mine being made. Two electric hoists have been erected and a large force of miners is at work. Fred E. Corning and Capt. Murdoch Wiley, of New York, are among the directors of this new company.

The American and English speaking population of Guanajuato now numbers about 600. For these there have been established recently an Episcopal and Christian Science church, besides the Methodist Missionary church established some time ago. The Masons have a strong lodge and hold a meeting twice per month. Furthermore, the American school has been established and is being conducted under the public school system of the United States. The mining companies have contributed largely to the support of the school. The program of studies and grades approximates that of the American schools. It is proposed by the American colony to erect a schoolhouse, Masonic hall, an amusement hall, and a church on a tract of land in the best part of the city. It is hoped to get a charter from the Mexican Government. A majority of the English-speaking people at Guanajuato consists of college graduates who occupy positions in the managerial or technical departments of the mining companies. The railroad from Marfil is being built and Guanajuato promises to enjoy the best conditions of living. For these reasons it is not surprising that the mining properties in the district are being rapidly absorbed by American capital and it is expected that by the end of next year there will be 1,000 stamps in operation.

The erection of 30 additional stamps was begun by the Guanajuato Reduction & Mines Co., on Nov. 5, and the work is being pushed with vigor.

HIDALGO.

It is stated that John B. Farish has made an offer of 9,000,000 pesos for the Santa Gertrudis, at Pachuca. Carlos de Landero, who represents the owners, is said to hold the property at 15,000,000 pesos. There is a great deal of interest being taken in the established mines of Pachuca.

SONORA.

The sale of two famous gold and silver properties was consummated last week, involving the largest sum of money ever paid for a mine in Northern Mexico. Las Chispas, a famous producer, has been sold to a New York and Paris syndicate for 6,000,000 pesos, approximately $3,000,000 gold. The Badicanora mines, in the same district, one of the principal claims of the famous Antiguas group, has been sold to Dr. F. O. Pease, of Chicago, and associates. The consideration has not been made public.

Personal.

BEN. B. LAWRENCE is at Denver.

BEN. S. REVETT is in San Francisco.

WILLIAM A. FARISH is at New York.

E. D. MCDERMOTT is at present in Spain.

EDGAR RICKARD is expected home this week.

C. W. MERRILL has returned to the Homestake.

W. H. SHOCKLEY has returned to Manhattan from New York.

F. G. MOREHOUSE is visiting Boston from Guanacevi, Mexico.

F. C. ROBERTS is investigating dredging methods at Oroville.

R. GILMAN BROWN sailed from New York for London on December 8.

C. M. FUELLER has been examining mines near Breckenridge, Colorado.

D'ARCY WEATHERBE sails from New York for London on December 17.

A. E. KEABLES, of Denver, is at Silver City, N. M., on mining business.

R. Z. ADAMS, of Georgetown, has gone to Tonopah, Nev., on a mining deal.

M. E. MACDONALD is studying filter-pressing at Virginia City and Deadwood.

J. C. RALSTON is the new president of the California Miners' Association.

G. C. KIRBY is superintendent for the Gold Bar Dredging Co., at Chico, California.

GEO. B. PUTNAM has returned to Denver from City of Mexico and Globe, Arizona.

EDWARD W. SEBBEN is in Wickenburg district, Arizona, making examinations.

F. LYNWOOD GARRISON is examining mines in the Parral district of Chihuahua, Mexico.

RUFUS M. BAGG, JR., is on his way from Chihuahua to West Springfield, Massachusetts.

T. R. MILLER has gone to the Black Hills district in South Dakota on mining business.

W. E. WILSON of Boulder, Colo., is at Goldfield, Nev., looking at some mining properties.

W. E. THORNE is making an examination of copper mines in Shasta county, California.

JAMES W. ABBOTT, of Los Angeles, is examining mines in the Greenwater district, California.

ARTHUR L. WALKER has returned to his home on Staten Island, New York, for the holidays.

JOHN HENDY succeeds the late SAMUEL HENDY as treasurer for the California Miners' Association.

FRED. B. REECE is working in the cyanide mill of El Oro Mining & Railway Co., at El Oro, Mexico.

E. E. ABERCROMBIE is in Utah investigating the condition of the mines in which he is interested.

FOSTER HEWETT is engaged in professional work in San Bernardino county, Cal., and in southern Nevada.

A. C. LAWSON and HAROLD W. FAIRBANKS are experts in the Champion-Home litigation at Nevada City.

CHESTER F. LEE, of Seattle, has gone to Juneau in connection with Alaska-Perseverence matters for London clients.

L. C. GRATON, having finished his geological work in Shasta county, has gone to see the new camp of Greenwater, California.

COURTENAY. DEKALB is investigating the old placer mines in San Fracisquito cañon, in Los Angeles county, California.

H. C. CARR, formerly metallurgical engineer with the Joshua Hendy Iron Works, has been appointed superintendent for the Nevada Con. Mining & Milling Co., at Wadsworth, Nevada.

Books Received.

AFTER EARTHQUAKE AND FIRE. This is a handsome volume of 200 pages, illustrated by a number of unusually good halftones and describing the events that drew the attention of the civilized world to San Francisco in April last. The articles are those that appeared in the MINING AND SCIENTIFIC PRESS at that time. Among the authors are G. K. Gilbert and F. L. Ransome of the U. S. Geological Survey, Professors S. B. Christy and A. O. Leuschner of the University of California, F. Omori of the University of Tokio, Philip Argall and J. Parke Channing, W. H. Storms, D'Arcy Weatherbe, and T. A. Rickard. It is a book with a present interest and a future historic value. Price $1. For sale by the MINING AND SCIENTIFIC PRESS and its agents at Denver, Chicago, and New York.

CLAYS, Their Occurrence, Properties, and Uses, by Heinrich Ries. An octavo of 490 pages, well illustrated. This is a valuable book on a special subject by a specialist of high reputation. It covers the geologic origin of clays, their chemical and physical properties, the varieties, the methods of mining and manufacture, and the distribution of the mineral in the United States. Published by John Wiley & Sons, New York, and for sale by the MINING AND SCIENTIFIC PRESS at $5.

OUTLINES OF QUALITATIVE CHEMICAL ANALYSIS, by Frank Austin Gooch & Philip Embury Browning. Published by John Wiley & Sons, and for sale by the MINING AND SCIENTIFIC PRESS at $1.25. This is a small octavo of 145 pages. It gives a brief outline of methods based on many years of college teaching. So far as possible, simple ways of treatment are presented, but certainty of result has been made the main issue.

THE ILLINOIS STATE GEOLOGICAL SURVEY has issued Bulletin No. 3, giving a detailed account of the composition and character of Illinois coals, with chapters on the distribution of the coal beds and tests for calorific value.

Dividends.

On December 4, the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. III, of $360,000. This makes the total paid since January 1, 1906, $2,340,000, and the total to date, $7,866,000.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.

San Francisco and Oakland, December 13.

Argonaut	$4.72	Furnace Creek	$4.00
Con. Virginia	1.25	Savage	1.18
Mexican	0.98	Sierra Nevada	0.80
Ophir	3.45	Yellow Jacket	0.78
Belmont	6.25	Montana	3.80
Jim Butler	1.47	Mohawk	15.00
Jumbo	3.95	Red Top	3.85
Jumping Jack	0.52	Sandstorm	0.70
Manhattan Con	1.10	Silver Pick	1.65
Midway	2.60	Tonopah Ex	6.00

ANGLO-AMERICAN SHARES.

Cabled from London.

	December 6. £ s. d.	December 13. £ s. d.
Camp Bird	1 9 6	1 9 0
El Oro	1 7 6	1 7 0
Esperanza	2 14 6	2 15 6
Dolores	1 11 3 bid	1 7 6
Oroville Dredging	1 1 3	1 0 6
Stratton's Independence	0 3 6	0 3 0
Tomboy	1 12 6	1 12 6 ex. div

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.

By wire from New York.

	Closing Prices— December 6.	December 13.
Copper—Lake (cents per lb)	22.70@22.90	22.80 @23.10
" Electrolytic "	22.10@22.35	22.35 @22.60
" Casting "	22	22¼
Lead "	5.75	5.75
Spelter "	6.45@6.50	6.50 @6.55
Silver (cents per oz.)	68⅜	68⅜

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

HYDRAULICKING has been used successfully at Cobalt, Ontario, to strip the surface, exposing the veins underneath the soil and moss. A nozzle with a 3¼-inch giant was employed.

THE copper ore of the Ducktown district in Tennessee is essentially a massive pyrrhotite, containing interspersed particles and stringers of chalcopyrite. The ore averages about two per cent.

THE deepest mining in Western Australia is at Kalgoorlie, where the Great Boulder Proprietary mine has recently found pay-ore at 1,900 ft. This mine has paid £2,315,800 in dividends to date.

THE ZINC deposit of the Potosi mine in the Spring Mountain range in southern Nevada consists mainly of the carbonate of zinc in a Carboniferous limestone belonging to the same geological horizon as the 'blue limestone' of Leadville.

A MECHANICAL STOKER that is likely to come into wide use for smelting and other furnaces, is to be installed on certain of the Chicago & Northwestern R. R. locomotives. The machine is capable of hurling coal into the fire-box at the rate of 200 shovelfulls per minute, if necessary.

EXCLUDING the comparatively thin crust, 1/80 the earth's volume, there are strong indications that the earth consists of a non-radio-active substance with a rigidity approaching that of steel, with an average temperature of about 1,500° C. and a density at that temperature of, say, 5.6.

THORITE is a valuable mineral that may be found in the black sands of the Pacific slope. It occurs as heavy black cubes, resembling altered pyrite. It is usually associated with zircon, monazite, etc. The value chiefly depends on its use for the manufacture of incandescent gas mantles from the oxide of thorium.

AT the Granby Consolidated, in British Columbia, the total cost of operations, as given in the recent annual report, was $3.29 per ton of ore. The net cost of the copper produced was 8.35 cents per pound, after deducting the value of the gold and silver obtained. The output included 19,939,004 lb. copper, 316,947 oz. silver, and 50,020 oz. gold.

BENTONITE is a fine-grained clay, it has a soft unctuous feel and when mixed with water it makes a perfect paste. It is essentially a hydrous silicate of aluminum, akin to kaolin. The chief use for it is for giving body and weight to paper, but it is also employed in antiphlogistine and as an adulterant in candies. The chief deposit is in the Laramie basin, in Wyoming.

BLASTING in rock at high temperatures may be effected by putting a hose in the drill-hole with a running stream of water for some time immediately before blasting. The powder may then be wrapped in sheet asbestos and the fuse fixed in the cartridge and lighted before being inserted in the hole. The hose should then be quickly withdrawn, the cartridge inserted and tamped promptly.

DRILLING in soft rocks, such as slate, that sludge quickly, may be slower than in the toughest trap. The success of the Leyner drill in friable rocks depends largely on the use of water under pressure. The time taken to drill a hole in such rocks, neglecting that lost in fitchered holes, may be twice that of working in ordinary granite. In sandstone, drill-steel should be used with a blunt square end $^{3}/_{16}$ inches thick.

THERE is no limitation to the number of lode-claims which may be located by an individual provided there is a lode or vein in place actually discovered within the limits of each location. Locations paralleling side-lines of other claims would be invalid unless they were based upon separate discoveries. Extensions of an original location on the end-line of a discovery claim could be made by the same locator provided that he discovers the vein actually to exist in the extended claim.

MURIATIC ACID is a name which dates back to the eighteenth century when chlorine was supposed to be oxide of murium. The elementary nature of chlorine was established by Davy in the first decade of the last century, a discovery which dealt a death blow to the theory that all acids were oxides. That this monument of a theory, based on false hypotheses, and long since buried in oblivion, should be retained, is a mere confession of ignorance on the part of certain would-be chemists.

IN connection with designing sluices to give best results for transporting material combined with most efficient gold saving, it has been practically demonstrated that wide sluices carry more material with less grade than narrow ones and save more gold. The principle of saving gold depends upon having the thinnest film of material traveling along the bottom of the sluice in continuous motion, using a sufficient depth of water only to prevent the fine sand from packing the riffles. The depth of water in all cases must be sufficient to cover the large stones, for example, if the material to be sluiced carried a large number of stones 6 to 8 in. diam., the depth of water should be about seven inches, and on this basis the width and grade of the sluice-box should be figured out. It is impossible to go fully into the merits of the questions of *A* and *B* without first knowing the quantity and sizes of the material to be treated, but on general principles the sluice of *A* will give the best results. The sluice of *B* with about one-half the quantity of water used by *A* will, with similar material, give same results as *A*'s sluice.

THE San Francisco fire taught emphatically that the most vulnerable part of a building, in the case of a big conflagration, is the roof. Several forms of fireproof roofing are now being put forward, and at least two styles are guaranteed to resist flames under all conditions: These two forms are metal shingles and clay tiles. A third, and probably the greatest achievement in tile-roofing from a utilitarian as well as esthetic point of view, is the use of glass. In the first place glass tiles are of the same pattern as clay tiles, and in factory work, upon an open-steel construction, may be inserted just as a clay tile would be in any number or in any position required. This does away with the cost of sheet-metal work, and the absence of this, or even of wire work, is important in many other respects. Galvanized iron and tin yields quickly when it comes in contact with the gases that arise almost invariably from reduction works, factories, and the like. The life of this customary support to the skylight is three years; the glass tile moreover, washes clean, while glass surrounded by sheet-metal work never does. Finally, the light obtained from the use of tile skylights is far superior to that obtained in the old way, the corrugated surfaces of the tile acting prismatically, and perfect dissemination of light follows.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanide Practice With the Moore Filter.

The Editor:

Sir—Mr. R. Gilman Brown's recent contribution to the literature of vacuum filtering, entitled 'Cyanide Practice With the Moore Filter,' appearing in your issues of September 1 and 8, is one of the few articles that have been published on the subject of increasing interest and growing importance to those who have to face difficult problems in cyanidation. Of the few articles so far published, Mr. Brown's is by far the most thoughtful, and contains detail that others have not attempted to give.

As the writer had more or less to do with the construction of the Bodie plant, and its subsequent operation, and since then has had the opportunity of comparing it with the Butters-Cassel installation at the Combination mine, Goldfield, Nevada, the Butters' plant at Virginia City, and the Moore plant at the Liberty Bell mill at Telluride, Colorado, he has gathered a few facts pertinent to the discussion that may be of some interest.

At the Standard, silex blocks for tube-mill lining were a failure; at the Liberty Bell they are a success. The difference in results can apparently be attributed entirely to the different pebbles used—to the difference in the thickness of the material fed to the tube-mills—and to laying the silex blocks edgewise instead of flatwise, in the later lining. The other factors affecting the life of the lining can be neglected, in this comparison, as the silex blocks are of the same grade, and look to be from the same quarry; the speed of the mills is the same, and it would be hard to find two ores more nearly the same (with regard to the percentage of hard quartz and soft slime-forming material) than the Liberty Bell and the Standard Consolidated ores.

At the time the silex was tried at the Standard, local pebbles of miscellaneous character, and largely of igneous origin were in use. Their consumption was about 50 lb. per ton of sand re-ground. To a large extent they wore flat, indicating a sliding rather than a rolling motion. At that time the tube-mill was fed almost entirely from spitzkasten underflow, carrying perhaps 20% to 25% solids. The silex was 2½ in. thick, and the lining lasted six weeks. At the Liberty Bell, a 2¼-in. silex lining in a mill fed from spitzkasten underflow gave four months of actual service. As all other conditions were practically parallel in the operation of these two mills, except the use of local pebbles in one and flint pebbles in the other, the short life of the silex at the Standard can, it seems, be blamed entirely on the local pebbles used.

At the Liberty Bell there are three tube-mills, one fed by spitzkasten underflow as already stated, while the others receive the discharge from Dorr scraping classifiers, a coarse product carrying from 45 to 50% solids. In these mills, also, the silex blocks have been set on edge, forming a lining four inches thick. By setting the blocks edgewise, it seems likely that the wear is increased as the bedding planes of the original limestone seem to be parallel to the flat sides of the blocks. Capping is certainly not so bad with the edgewise blocks. The edgewise lining has already had nine months of actual service, and seems good for several months more. Roughly, the lining in the mill receiving spitzkasten underflow wore at the rate of one inch in two months, as there was some waste, of course, when it was finally removed. In the other mills the rate of wear has been just about half of this or one inch in four months. Here, then, are three mills on the same ore, and operating under nearly identical conditions, except for the matter of thickness of pulp fed. In the mills receiving the thicker pulp the wear of linings is about half that in the other. The duty of the four-inch lining has been something over 9,000 tons of sand re-ground per inch of wear.

These facts are again illustrated by later results with the tube-mill at the Standard. There, the first wrought-iron lining of ⅜-in. plates lasted 90 days and re-ground about 4,800 tons of sand. During its life only a small tonnage of pond-tailing was introduced to the mill. About the time the second lining of the same kind was put in, arrangements had been completed for introducing pond-tailing in addition to the daily mill tonnage, up to the full capacity of the filtering plant. The percentage of solids in the tube-mill feed during the life of the second lining averaged around 45%, as against 20 to 25% before. The life of the second lining was 170 days as against 90; the total tonnage of re-ground sand increased from 4,800 to over 10,000, and the pebble consumption dropped from 6.5 lb. per ton to 2.6 lb. All other conditions were the same. These results speak for themselves. At the Standard, the cost for local pebbles at $9 per ton laid down at the tube-mill was $0.225 per ton of re-ground sand, while the cost for flint pebbles under the same conditions at $70.20 per ton of 2,000 lb. laid down at the tube-mill was only $0.233 per ton re-ground, and this has since dropped to $0.091 per ton. Good technical results have been obtained with the Moore plant at the Standard during the last half year. The extraction has been increased and the cost lowered. These results are entirely to the credit of Mr. H. H. Kessler, who had been in charge of the plant since the first of the year.

At the Standard, during the time the tube-mill was shut down waiting for the cement to harden in the silex lining, the Moore plant limped along as best it could without re-grinding. The sand accumulated wherever it had a chance. The settlers, the agitators, and the filtering vats all furnished their quota of sand and grief. A crew of about six men was kept busy all the time repairing filters, and this one month alone made a decided increase in the costs for the whole year.

Mercury-step bearings for the agitator shafts were a good deal of a failure. The balls ground the iron and the mercury together into a nice iron amalgam, and their use was abandoned.

Mr. Brown has described the basket hoisting arrangement at the Standard. At the Liberty Bell, the baskets are hoisted for transfer by means of hydraulic cranes, operated under a pressure of 250 lb. These work well, and give much less trouble than the differential chain hoists at the Standard. Where high-pressure water is not available, an automatic high-pressure pump installation, such as is used for elevator service, could be utilized. At the Liberty Bell also, an independent electric motor drive is used for traversing the cranes. This is much the best arrangement where one crane serves a number of baskets. The long filter as installed at the Standard did fairly good work, but there was, nevertheless, considerable trouble from twinning or coalescing of the cakes on adjoining filters, which prevented efficient washing. The filters continually broke loose from the spacing bars, and before the writer left Bodie he was seriously considering the advisibility of dividing each of the 16-ft. filters into two units and stretching the canvas on iron frames. This was not done, but, from the experience elsewhere with the smaller filters, it would be an improvement. Mr. Brown has called attention to the greater efficiency of the filtration when the pulp is thick. This is a matter that should not be overlooked in the design of filtration plants, as it affects the capacity in a very large degree. The reason seems to be mainly that in the thicker pulps the sand is buoyed up, and a better and

more permeable admixture of sand and slime is obtained in the cakes.

It is satisfactory to record that the estimated capacity of the Standard plant of 3,000 tons per month has been exceeded by 500 tons during the months when uninterrupted excavation could be carried on in the ponds. Mr. Brown's statement that there was no accumulation of weak solution in the plant, applied to the first period of the operations. After all sources of mechanical loss of solution had been eliminated there was a constant accumulation of weak solution, which had to be run to waste. Mr. Brown makes incidental mention of the Butters-Cassel process as being an inversion of the Moore process, and points out the common essential feature of the two, which is, the adhesion to the filter of a cake of slime, thereby making possible its removal from the unfiltered remaining pulp. In the Moore process the filters are transferred from loading to washing vat, etc., and back again, while in the Butters-Cassel process the filters are stationary, and the pulp, wash-water, etc., are transferred to and from the filtering vat. When large capacity can be obtained from a relatively small filtering plant, the Butters-Cassel process has several advantages over the Moore process, but where the filtering plant must be large, the reverse is true.

It must be borne in mind that there is a wide variation in the slimes made from different ores and that they act differently in filter-plants, so that a plant designed to handle a certain tonnage at one mine will have a different capacity at another. Thus, at the Combination mill at Goldfield, the loading period is only 30 minutes, while at the Standard it varies from 2½ to 6 hours, depending on the proportions of clay slime and fine sand in the charge, and the thickness of pulp. Therefore, a plant designed to handle 60 tons per day of Combination slime would fall far short of handling 60 tons of Bodie slime. At the Liberty Bell the loading period is one hour, while at Butters' Virginia City plant, the time varies from 30 minutes to one hour. At all of the plants it is the aim to build up a cake of from ¾ to 1 in. thick.

It will be assumed here that the essential operations of loading, washing the cake, and discharging in water, will require the same length of time with the two processes on the same slime, and this discussion is consequently narrowed to a consideration of the relative merits of transferring the filters and transferring the pulp, wash-water, etc. It is true that with the Butters process a somewhat higher vacuum can be maintained within the filter, on account of the possibility of arranging for bottom solution discharge from the filters, which cannot be done easily with the Moore process. The difference is not great, however, as the solution is raised in the suction pipe in the Moore filters on the principle of the air-lift, and there is not, consequently, a solid column of solution, reducing the vacuum foot for foot of lift in the suction pipe. The rate of loading, also, does not increase directly with the vacuum, but is greater at times with a lower than with a higher vacuum.

At the Liberty Bell, when everything is working smoothly, the Moore plant will just about hold even with the mill crushing 350 tons per day. In order to give the cakes a preliminary weak solution wash and allow also for repairs, another set of filters and another washing vat are to be installed. Besides the necessary settlers and agitators, the plant at present contains six vats, two of which are for loading, and five baskets or filter sets. The baskets are transferred by two overhead traveling hydraulic cranes, and each transfer takes ten minutes. Each complete cycle requires two hours and forty minutes, divided as follows: One hour and ten minutes loading and transferring; one hour and thirty minutes washing, discharging, and transferring back to loading vat. The time required for a cycle with the Butters-Cassel process depends on the time required for transferring pulp, water, etc., which is dependent on the size of vats and pumps.

To arrive at a comparison, let it be assumed that the Liberty Bell plant is to be changed from the Moore to the Butters system. Instead of the present arrangement of two loading and four washing-vats, these, and the additional ones necessary will be used for all operations. At Virginia City the time of filtering and emptying the filtering vats is from 15 to 20 minutes. At the Combination it is from 15 to 25 minutes. Each filtering vat at the Liberty Bell contains 3,050 cu. ft. A 6-in. centrifugal pump at normal speed would fill or discharge a vat in approximately 28 min., a 7-in. pump in 18 min., an 8-in. pump in 14 min., and a 10-in. pump in 7.5 minutes. The large pumps involve the use of large valves, which are a source of trouble in pumping sand, while the smaller pumps involve a larger plant. For a middle course, let us consider the installation of 7-in. pumps. It will practically be necessary to install a pump to each vat, in order to avoid undue valve complications. The cycle for each vat, then, will be as follows: Loading one hour, pumping out pulp 18 min., pumping in water 18 min., washing the cake one hour, discharging 15 min., pumping back water 18 min., pumping in pulp 18 min., total 3 hr. 27 min., say 3 hr. 30 min., as that much, if not more, extra time will easily be consumed. This cycle is longer by 50 min., than with the Moore plant. At 45 filter-charges per day—the usual run—there is a total time increase of 37 hr. 30 min. required to handle the tonnage, and provision will have to be made to handle 11 extra charges per day over what the present plant would take care of. This means the installation of three more filter sets and two more vats. In addition, two storage vats would have to be provided, one for water and one for pulp for taking care of the flux of material during operation. These should have a capacity of at least 6,000 cu. ft. each, and more than this would be desirable. We have, then, two filtering vats of 3,000 cu. ft. capacity, three additional baskets, eight 7-in. centrifugal pumps, with the necessary pipe connections, three-way and single valves, belting, line shafting, motor drive, etc., and a light crane for handling filters for repairing; and two storage vats of not less than 6,000 cu. ft. capacity each, all of which are balanced against two heavy traveling hydraulic cranes, with the necessary heavy track supports. Roughly, the first cost would be about $6,000 at Telluride in favor of the Moore process. The chief expense, however, amounting to more than the increased first cost, would be the power cost for driving the centrifugal pumps. The power required for pumping would vary from a minimum at the beginning to a maximum at the end of the transferring period, complicated of course by the workings of the various pumps, to the extent of their effect on the height of material in the storage vats. At the Liberty Bell, any arrangement that could be made without the reconstruction of the present filtering vats, would necessitate each pump working against a maximum head of 19 ft., and each pump would then take about 11 h.p. part of the time. As power is bought on peak load in the Telluride district and costs a minimum of $5 per horse-power month, it would be hard to say what the extra power bill would be. Should four pumps be working near the maximum lift at one time, which would not be unlikely, the bill for the month would be about $225. It would probably not be less than $150 any one month, and might run up to $300 or $400. There would be no saving in labor in one plant over the other, as one man on a shift would be required to attend to the filtering in either case.

EDWARD H. NUTTER.

Telluride, November 25.

The History of Mining at Guanajuato.

Written for the MINING AND SCIENTIFIC PRESS
by T. A. RICKARD.

It is uncomfortable to arrive at one's destination just before dawn, but the discomfort is not without compensation. Owing to the wretched train service between Mexico City and Guanajuato (406 km. or 252 miles), one arrives at Silao at 1 A. M. and then, changing to a branch railroad 14 miles long, one arrives at Marfil at 3 A. M., whence a horse-car bears the traveler to Guanajuato, a distance of four miles and occupying an hour. The car is pulled by mules, at a sharp trot, along a winding tramroad that follows the bottom of a ravine; there are glimpses of high walls, dark archways, and silent courtyards, an occasional hooded figure comes within the rays of the feeble lamp at the front of the car, other lights are infrequent; soon the tram penetrates a thickly built town, the mules awaken echoes as they scramble over the cobbles; the reverberations are lost in narrow alleys, but there is no sign of life, save the occasional watchman who blows his whistle to prove himself awake and to prevent the other watchmen from falling asleep—incidentally telling any prowler just where to avoid him. Up a steep gradient, almost brushing the walls that look down on either side, around sharp turns that threaten a capsize, over a narrow bridge and along a stream flanked by rustling trees, and then the journey is over. A friend conducts me to a lofty wall, a door opens, we are in a moonlit *patio*, in front of a white collonade, in that light as poetic as the moonlight itself, the effect of which is heightened by a sound as of surf borne inland from the shore; it seemed the voice of the distant sea, but it was the muffled roar of a stamp-mill. However, that rhythmic swell served to put me to sleep, deeply grateful for a little rest after the tiresome travel of the night. This was part of the compensation, but the best of it came on awakening three hours later.

It was a sunny morning, with all the coolness of the highlands and all the fragrance of the tropics; going on the portico, I found myself overlooking a lawn behind which extended an array of steel tanks indicative of a cyanide plant; to the right were the white-washed houses occupied by offices and to the left rose a loftier building—audibly, a stamp-mill. The whole foreground was surrounded by a wall on which the sunlight played gladly. Beyond were low roofs and trees, rising on hill-slopes, partly under cultivation and leading to a brown ridge whose clear-cut edge was silhouetted against the blue of a perfect sky. It was the Hacienda San Francisco de Pastita, an old Mexican reduction works, now transformed to modern methods, it was an island of Anglo-Celtic energy in the midst of an old Spanish mining centre, and the spirit of the men and the machinery of this new mill of the Sirena mine was to the old era represented by the decrepit town outside its walls as the invigorating sunshine of this bright morning to the dark weariness of my experience during the night that was past.



Guanajuato. One of the Great Mining Cities of Mexico.

Guanajuato, in the State of the same name, is a city of 50,000 people, situated at an altitude of 6,600 ft. among the foothills of the Sierra de Santa Rosa. The air is dry and clear, colors are vivid, lines are defined, and the sunlight is brilliant. The town is not without character, for it is adorned by many churches and other impressive buildings; it lies ensconced among terraced gardens and brown hills, on the higher slopes of which stand the battlemented enclosures and picturesque churches of historic mines. Their story is worth the telling.*

The history of Guanajuato begins in 1526, six years after the Spanish Conquest, when the mineral wealth of Mexico was being eagerly sought out by the hardy *conquistadores*. To the north, the mines of Zacatecas and San Luis Potosi had been uncovered; the road to them, from Mexico City, passed near the site of Guanajuato, but in those days it was dangerous to depart from the highway, for the natives, the Chicemecas, were unfriendly. A fort was built at Santa Ana, and this became the first European settlement in the region. Prospecting became more practicable, but no mineral

*And in the telling of it, I am indebted for many of my data to Capt. W. Murdoch Wiley, who has studied the records.

discovery of importance followed, until 1548, when the silver mine of San Bernabé was discovered at La Luz, six miles from the Guanajuato of today. Two years later rich ore was found on the hills adjacent to the present city, the Rayas mine being started by a Spaniard of that name. The document that registered this fact is the oldest in the archives of the Court of Mines at Guanajuato. It was not until nine years later that the work done at the Rayas and Mellado mines led to the recognition of the mother vein, *la veta madre*. The ore was mined for a width of 100 ft., so wide indeed as to postpone further exploration along the course of the lode. But the ore found by the Mellado shaft, in 1559, suggested the idea of continuity and caused an extension of activity, so that it was not long before mining operations were under way from the Tepeyac to the Sirena workings. To those of us who regard the discovery of the Indians and the other forbade the branding of a slave in the face.

Within a century, that is, by 1700, the population quadrupled and the camp doubled its area. Immigration was slow, for Spain was a long way off in those days of uncertain sea voyages; the transport of supplies was both laborious and hazardous, the whole European population of Mexico was still meagre, and mining methods were as yet primitive. But the discovery of gunpowder and its application to mining, the introduction of pumps and the accumulation of wealth among the mine owners, all tended to enlarge the scale of operations until Guanajuato, toward the end of the 18th century, became one of the great mining centres of the New World.

The big mine owners won such wealth that, like their modern successors in Nevada and Montana, they became legislators and were given seats in high places; they



Near La Presa. The Modern Quarter. La Bufa in the Background.

Comstock, less than 50 years ago, or even the event at Sutter's Mill, 58 years ago, as a historic event, it is worth noting that the happenings briefly chronicled in the foregoing lines occurred before 1600 — before the first settlement of Virginia, shortly after the sailor captains of Elizabeth had swept the Spaniards off the seas, and just about the period when Shakespeare and Bacon were busy preparing documents of controverted authorship.

By this time the population of the town had grown to 4,000, and it continued to increase as villages sprang up around the individual mines. In 1619 the town was granted a patent, becoming dignified by the name of Villa Real del Guanajuato. This was a year before the landing of the Pilgrim Fathers at Plymouth.

The industry grew; amalgamation was introduced from Pachuca, the first *patio* being started at the Hacienda de Duran, just below the Rayas mine. The best selected ore was smelted on the spot and, considering the high grade of it, the slag was surprisingly clean, for the remains of old smelter dumps below the Rayas and Cata have been found to assay only two ounces of silver per ton. Forced labor, of course, was employed, and two proclamations bear testimony to the brutality of it, for one of them prohibited the indiscriminate sale of

were granted titles of nobility and enlivened the ranks of Spanish aristocracy. José de Sardañeta was created Marquis of Rayas; Francisco Mathias, the owner of the Cata and Secho mines, became Marquis of San Clemente and Viscount of Duarte, while Antonio Obregon, the discoverer of the Valenciana, became Count of that name. It was a great day for these mine operators. They were consulted in affairs of State, just as nowadays men who contribute to campaign funds are likely to possess what Mr. Mike O'Flaherty termed 'infloo-ence'; they posed as Providence to the poor people, for when times were hard and the corn crop was a failure, they provided work for the needy and saved them from starvation. It is said that the big galleries and comfortable cross-cuts, large enough for the passage of a broad-gauge locomotive, that surprise the mining engineer when he first visits Guanajuato, are the evidence of work carried out with such charitable intent.

When an unusual bonanza was struck, the fortunate miner built a shrine or even a church, in token of gratitude to his tutelary saint. Thus one Sardañeta advanced an adit so as to cut the Santa Anita ore-shoot on its dip, but failing to reach this point before he died, he told his son to continue the good work. He did, and found the

bonanza of Santa Rosa, which made the Rayas mine famous. This Sardañeta became Marquis of Rayas and erected the monumental buildings whose flying buttresses and sculptured portal, surmounted by the figure of the archangel Michael, are today the glory of the San Miguel shaft-house.

The church of Valenciana is another such memorial of successful prospecting. This edifice was consecrated in 1778; though badly cracked in many places and doomed to destruction, its fine harmonious facade in carved *cantera* was rendered doubly impressive when I saw it at the end of a day's investigation of the old mines, and, full of reminders of a most romantic chapter of mining history, watched the shafts of sunlight suffuse the old church front with a glory richer than that of the treasure vault of silver that it commemorated. The church was built by Antonio Obregon, a Spanish miner, who discovered a great orebody north of the Cata mine, in ground that had long been held to be barren; he had thought otherwise and prospected for three years until penniless. Then a merchant of Guanajuato provided some funds, until he too was bankrupt. Others were persuaded to share in the venture, only to lose their money, until Obregon won the name of *el tonto* (the fool) *de Valenciana.* But his justification came at the end of seven years of persevering work, when he broke into the biggest bonanza ever found on the Veta Madre. It was much more than his fondest expectation, for, while the Tepeyac had been worked in a desultory way from 1590 and the outcrop of that vein in the Valenciana ground has yielded some ore, it is doubtful whether any such ordinary body of mineral would have repaid the long and expensive search made by Obregon and his backers. In a few months all the expenses of years were repaid and eventually Obregon became, the chronicle says, the richest man in the world, at that time. The immediate origin of the church is told thus: On the ground near the mine, Obregon marked out an irregular quadrangle within which the miners were told to place the handful of rich ore which each man was allowed, for this exceptional purpose, to bring out of the mine. It was a custom that recognized the innate tendency of the miner to purloin a little—a specimen or a sample—of the rich ore that he was helping to extract; and by requiring his men to donate that larcenous portion of mineral for the benefit of Holy Church, Obregon was finally able to do a great deed without unduly taxing his own receipts. The quadrangular area referred to was eventually covered three feet thick with rich ore; this was sold and the proceeds of it were employed to build the church. It was begun in 1765 and finished in 1785; it is said to have cost $1,000,000, which was about equivalent to the annual income of Obregon. He made gifts to the Crown and, becoming the wealthiest subject of Spain, he was made Count of Valenciana. This was at the time of the American revolution and since then we have had many a Monte Cristo among mining adventurers, a motley crew of ill-balanced men, from vulgar spendthrifts like Tabor and Barnato to great-minded builders of empire like Cecil Rhodes and Alfred Beit.

At the end of the 18th century the mines of Guanajuato were the foremost of their kind. It was then that the Valenciana shaft was sunk to 1,800 ft., and it is still the deepest in the district. This work, done by Obregon, was completed in 1785 at a fabulous expense. It is said to have cost a million, though even this expenditure becomes small relatively to that of the Combination shaft, sunk on the Comstock lode, in 1881; this was 3,100 ft. deep and cost $6,000,000. However, the cost of the big shaft of the Valenciana was offset by an extraordinary production, stated at $300,000,000, most of it extracted during the last half of the 18th century. This figure corresponds with the total output of the Comstock up to the time when the lower workings were abandoned, in 1884. On August 20, 1804, the King's tax, amounting to the sum of $2,648,866 was paid. As this represented one-fifth of the yield of a period of five years, it serves to substantiate even the extraordinary statistics of these old mines. The other mines on the Veta Madre and those on La Luz veins also produced enormously at this period, so that the population of the district at the beginning of the 19th century had increased to 100,000. This was the time of Humboldt's visit. He says that "the whole vein (the Veta Madre) of Guanajuato may be estimated at four ounces of silver per *quintal* of minerals." As a *quintal* is 100 lb., this means ore averaging 80 oz. per ton of 2,000 pounds.

Then came the long years of the revolution against Spanish domination. In 1810, when at the height of her prosperity as a mining centre, Guanajuato was attacked by the Republican forces under Miguel Hidalgo, a priest, who became the hero of the Mexican war of independence. There was desperate fighting and the city was captured. The entire fabric of government and of business went to pieces. The warring factions made forced loans on the mines, horses and provisions were wantonly seized, life became insecure, so that mining operations were discouraged and all work of importance was discontinued. Deep work ceased entirely, no shafts were sunk, and the production of ore was reduced to infrequent shipments taken from supporting pillars and from the sides of old stopes. Even such decadent mining became insignificant as the miners were driven toward the surface by the slowly rising water. It was at this period of general lawlessness that the heavy walls with watch-towers were built around the mines, until every property of consequence had the look of a fortress. Similar protection was given to the reduction works, which became fortified enclosures, for the *patios* were frequently robbed of their clean-up by roving bands belonging to both factions, who made the necessities of their organization an excuse for a general system of pillage and murder. The battlemented ruins that survive in the vicinity of Guanajuato, are eloquent of this period of lawlessness and afford today a picturesque setting to mines already romantic through their earlier traditions.

Twelve years elapsed before the Spanish rule ended in the crowning of Iturbide as the first Mexican Emperor, at Mexico City, on July 21, 1822. During the interval the population of Guanajuato dwindled to 20,000 and mining almost ceased. With the restoration of order, the mine-owners set to work to rehabilitate their properties. Among the most enterprising was Don Lucas Alaman, who represented the new Republic at London and was an enthusiastic believer in the mineral wealth of Guanajuato. He interested English capitalists in his schemes, with the result that two large companies were formed, the United Mexican Mining Association and the Anglo-Mexican Mining Company. They acquired several of the biggest mines on the Veta Madre, besides others of the Sierra and La Luz systems. The old workings were unwatered and the mills were renovated. But it was not smooth sailing for these English companies, there were periodical local insurrections, life and property were still insecure, and mining was attended by many interruptions. In 1832, one Ariste, at the head of a 'regenerating army,' or *ejercito regeneradoro*, swooped down on the Rayas mine, then the property of the United Mexican Co., and lifted silver and corn to the amount of $26,000.

THE scientific distinction between solid and fluid may be derived from the common idea of a solid as that which has a form of its own, while the fluid takes the form of the containing vessel, bounded by a level surface on top.

Recent Improvements in the Cyanide Process.

By F. L. Bosqui.

*It was nearly twenty years ago that two Glasgow chemists, MacArthur and Forrest, made the first practical application of the dissolving action of a dilute cyanide solution on gold. The process was at once adopted in New Zealand and South Africa. In the latter country all the conditions were most favorable to its success; and the enormous profits yielded by the pioneer plants at once established cyanidation as a process of the greatest commercial importance.

The procedure adopted in the Transvaal was simple in comparison with recent modifications of the process. The tailing from the stamps, after hydraulic concentration of coarse sand and sulphides, was gathered in leaching vats; the slime that overflowed was run into huge shallow vats, the surplus water decanted, and the slime subjected to a series of agitations and decantations, until the mineral that it was found economical to extract was finally precipitated from the solution.

At first, zinc shaving was universally used as a precipitant, but this was superseded by the electrolytic deposition of the gold on sheets of lead. This was adopted in all the representative plants; but its popularity soon waned, owing to the production of troublesome by-products, the awkwardness of the clean-up and bullion recovery, and the unsatisfactory deposition as compared with that obtained on zinc. Its chief advantage was that it recovered the values from extremely dilute solutions, but this advantage was nullified by Betty's discovery that zinc shaving, if dipped in a weak solution of lead acetate, would accomplish the same thing.

During recent years, no radical changes were made in the process in South Africa. This was due to the serious blow given the mining industry by the Boer war; and also, in part, to the conservatism of metallurgists on the Rand and their reluctance to adopt important innovations originating elsewhere. The brothers Denny were the first of the Rand metallurgists to recognize the importance of finer grinding, and their energetic advocacy of tube-milling and filter-pressing finally resulted in the acceptance of Australian methods.

It was during the lethargy of cyanidation on the Rand that the filter-press and the tube-mill were introduced in Western Australia. In this connection the interesting fact may be noted that all the important devices introduced into cyanide practice had been previously used in other industries. Even the pipe distributor used for distributing tailing in a leaching vat was an adaptation of the common lawn-sprinkler. The filter-press had been employed to strain solutions in the refining of sugar; the tube-mill had been in use as a dry-grinding machine in the cement industry.

The metallurgists of Australia never took kindly to decantation in slime treatment, and the introduction of the filter-press was the result. In justice to African operators, however, it must be said that decantation was well suited to existing conditions. The product they were handling was too low-grade to stand the prohibitive cost of filter-pressing. In Western Australia, the filter-press was applied to a much richer product, and one much better adapted to the method.

The obvious objection to the old type of filter-presses is the high cost of installation and operation, but they nevertheless enjoyed a great success; and it is worthy of note, in observing the evolution of the process, that they were a means of emphasizing the importance of fine grinding and helped to establish the tube-mill. It has always been a truism in cyanidation that the finer the product, the higher the extraction. This is the case with but few exceptions. To apply this principle required two things; an economical machine for fine grinding and a filtering system that would be at once efficient and economical. You are all no doubt familiar with the tube-mill as now applied in cyanide work. It consists of a sheet-steel cylinder with cast-iron ends, varying in size (the largest mills are 5 ft. diam. by 22 ft. long), and supported either upon trunnions or upon steel tires revolving on rollers like a chlorination barrel. The interior of the mill may be lined either with cast iron, or a species of natural flint known as 'silex.' The latter is the more commonly used, and is sold in two sizes; blocks 2½ in. and 4 in. thick. The silex lining is laid in cement and will last from four to eight months, depending upon the ore. When ready to operate, the mill is changed about half-full with flint pebbles. The product to be reduced is fed into the mill either through a spiral, or a device of the stuffing-box type, and the re-ground material is discharged at the opposite end, being finely comminuted by attrition against the flint pebbles and the lining during the slow revolution of the cylinder. The average speed of the tube-mill is from 25 to 35 revolutions per minute. The fineness to which the sand is reduced will depend upon several factors, chief among which is the amount of water used. The best proportion has been found to be one part solid to one part water. As a machine for economically reducing ore to an extreme fineness, the tube-mill has no equal. The cost of operation is variable. In this country and in Mexico it will range between 20c. and 40c. per ton. The work at El Oro, Mexico, and at Telluride, Colorado, is representative of the best practice on this continent; while that at the Combination mine, Goldfield, Nevada, probably represents the maximum of cost, owing to high price of power and labor. A small 4 by 12 ft. trunnion mill is installed at the Combination for sliming the 40-mesh product from a Bryan mill. The product of ten stamps, about 35 tons of ore per day, passes to the tube-mill classifier; and of this product about 75% goes to the tube-mill, or 24.6 tons per day. The following figures may be of interest:

Cost of 2½-in. silex lining laid in mill	$323.50
Life of lining	4 months
Cost of lining per ton of ore stamped	7.7 cents
Cost of pebbles delivered at Goldfield	$71 per ton
Consumption of pebbles	2.03 lb. per ton of ore stamped
Cost of pebbles per ton of ore stamped	7.1 cents
Power consumed	25 h.p. at $11.25 per h.p. per month
Cost of power	26.7 cents per ton of ore stamped
Summary, cost per ton of ore stamped:	
Pebbles	$0.071
Lining	0.077
Power	0.267
	$0.415

Tending the mill is one of the several duties falling upon one man, and the consumption of lubricants is almost negligible; therefore I have not included these two items in the cost. This cost of 41c. per ton may be assumed to be the maximum for tube-milling, owing to the very high cost of labor and transport in southern Nevada camps.

I have already referred to filter-pressing as an established practice in Western Australia. The press was never very popular in America, and few successful installations are recorded. The most noteworthy, perhaps, is that of the Gold Road mine, near Kingman, in Arizona, where two five-ton Dehne presses have been successfully operated for some time. About three years ago Mr. George Moore, after a series of failures in an attempt to filter-press slime at the mill of the Consolidated Mercur Co., in Utah, devised a vacuum-filter and installed a plant in the Mercur mill. This was the origin of the

*Revised by the author from a paper read before the American Mining Congress.

vacuum-filter, recent modifications of which are to be found at a number of mills in this country. Experiments recently made in Australia so far demonstrate the superiority of this method over all others, that it seems safe to predict the early disappearance of the filter-press.

The unit of the Moore filter is a rectangular wooden frame covered with canvas, and provided with a vacuum drain-pipe extending to the lowest point of the interior. These frames are grouped together in clusters or baskets, which are raised and lowered by means of a hydraulic crane. When lowered into a suitable compartment containing the slime pulp, the vacuum is applied to a common pipe connected with each frame. The solution is drawn through the canvas, and a slime cake varying from $\frac{5}{8}$ to $\frac{7}{8}$ in. thick is deposited on each side of the filter-leaf. The cluster of filter-leaves carrying the charge of slime, weighing several tons, is then lifted from the pulp, shifted automatically to an adjoining compartment containing the wash, where it is again lowered, the vacuum applied, and the displacing operation repeated. The load is again raised and shifted to a bin where the cakes are discharged by introducing air into the interior of the leaves.

The objections to the Moore filter are the high first cost of the mechanism required to shift the slime and the high cost of maintenance. The unmechanical and cumbersome features of this system led to the introduction by Cassel of a stationary filter, and the elimination of the awkward mechanism of the Moore scheme. It remained for Butters to adopt the Cassel principle, simplify it, and so modify it as to make it a pronounced success at his Virginia City plant. In the Butters filter, the leaves are set in a rectangular box or vat, the bottom of the box consisting of a series of pointed pockets, to facilitate the discharge of the spent cakes. The frames are approximately 5 by 10 ft. and consist of a piece of cocoa matting with a sheet of canvas quilted on each side, the whole being stitched on a frame of ½-in. pipe and securely sewed to this pipe-frame, which in turn is supported on a timber header. The bottom arm of the frame is perforated with small holes, through which the solution enters the pipe when the vacuum is applied. On one side the pipe frame is projected through the wooden header, and is connected with a common vacuum-pipe leading to the vacuum-pump. The frames stand parallel in the filter-box at about 4¼-in. centres. The pulp is drawn from the slime-reservoir and pumped into the bottom of the filter-box until all the frames are immersed. The vacuum is then applied until a cake of suitable thickness is deposited, and the excess of pulp is then withdrawn into the slime-reservoir. This operation is repeated for the wash, and the cake finally discharged into the bottom of the box by introducing water under a low head into the interior of the leaves. The accumulated cakes from each charge are removed by sluicing.

This system possesses the great advantage of simplicity and low cost of maintenance. A plant of any size can be operated by one man, who stands on a platform on a level with the top of the filter-box and manipulates the pumps with levers, and the valves with a simple drum-and-sheave mechanism. The 200-ton plant of this type in the Butters mill at Virginia City is operated at a cost of about 10c. per ton of slime.

At the Combination mill 40 tons of this slime per day are being filtered at a cost of about 45c. per ton, as follows:

Three men at $4; $12 per day	30 cents per ton
Twelve h.p. at $11.25 per h.p. per month	11 " "
Lubricants and incidentals	4 " "
	45 cents per ton

This plant, however, has a capacity of 56 tons per day. If worked to its limit of capacity, the cost would be reduced to 31c. per ton. The cost of filter-pressing at the same plant in the early days of operation was approximately $1 per ton.

The 15 h.p. consumed is used for the following purposes:

Driving a 4-in. Butters centrifugal pump.

Operating a 12 by 10 Gould's vacuum pump.

Operating a 2-in. centrifugal pump for raising the filtered solution to a clarifying filter-press.

Operating a 2-in. centrifugal pump for returning the slime-overflow from the leaching-vats to the slime-settlers.

Operating stirring mechanism in two slime-reservoirs, 14 ft. diameter.

The power may be distributed as follows:

For actual operation of filter, capacity 56 tons per day	9 h.p.
For agitating slime-pump	3 "
For uses not connected with filter	3 "

The cycle of operation in the Butters filter consumes about 3 hr. 20 min.; it will vary, of course, with the nature of the slime to be filtered.

This type of filter has been installed or is in process of installation at six mills, in Nevada, Mexico, and Salvador.

There are certain conditions, however, where the product to be handled is too low-grade to admit even of vacuum-filtering; these require special study and a special process. The need of a special process to suit a unique condition was never better exemplified than in the case of the Homestake ore.

I shall not venture to describe the different problems encountered and successfully solved by Mr. C. W. Merrill at the Homestake in the cyaniding of a tailing averaging less than $1.50 per ton. The next and most serious problem to engage his attention was the treatment of the slime, of which 1,600 tons per day of an average value of 80c. per ton have been run to waste from the Homestake mills. Mr. Merrill has devised a filter-press, the unique feature of which is that it can be automatically discharged by sluicing without being opened, thus doing away with the chief objections of the old type of press, namely, the cost of operating. This press is of a common flush-plate and distance-frame pattern, but consists of much larger units. The dimensions are as follows:

Number of frames	92
Size of frame	4 by 6 ft.
Length of press	45 ft.
Capacity of press	26 tons
Weight of press	65 tons
Thickness of cake	4 in.

The pulp is admitted to this press through a continuous channel at the centre of the top of the frames. When the cake is formed, cyanide solution is forced into the cake through channels at the upper corners. At the bottom of the frames, there extends a continuous channel within which lies a sluicing pipe, provided with nozzles that project into each compartment. This pipe can be revolved through an arc of any magnitude so as to play a stream into any part of the cake, washing it down into the annular space between the central channel and the solution pipe. When the press is being filled and leached, the discharge ends of this pipe are sealed. The method of operation is as follows:

The slime, after partial de-watering, consists of about three parts of water to one of solid. In this form it is charged by gravity to the presses at about 30-lb. pressure. The leaching with cyanide solution is done in the press, the effluent solutions being conducted to four precipitating vats where the gold is recovered on zinc dust. There is no power-cost for agitating or elevating, except for elevating the solution to the press. There will be only 0.6 ton of solution handled per ton of slime, of which only 0.3 ton will be precipitated. All filtering will be done by gravity at a cost of two cents per ton.

This plant is being erected on the basis of tests made

in a four-ton press of the type described. In all, 1,291 tons were treated with the following results:

Average assay-value of slime before treatment	91 cents per ton
" " " " after "	10 " " "
Extraction by assay, per ton	81 cents or 90 %
Recovered in precipitate per ton	83 cents or 91 %

The following facts relating to this important installation are of interest:

Estimated cost of slime-treatment	25 cents per ton
Estimated profit per year	$300,000
Cost of plant	$400,000
Cost of pipe-lines	$50,000
Area covered by plant	270 by 65 ft.
Area covered per ton of capacity	Two square yards
Cost of installation per ton of capacity	$300
Filter-press cost per ton of capacity	$60
Power required	1/10 h.p. per ton of slime treated
Water required for sluicing	4 tons water to one ton of slime

In the elaboration of the above process and plant, Mr. Merrill shares with the projectors of the vacuum-filter, the credit of the most noteworthy advance made in recent years in the metallurgy of the cyanide process. His method is admirably adapted to Homestake conditions; and its striking economical features must appeal at once to every engineer and manager who concerns himself with such vital things as costs and profits.

Whether an automatically discharged press can compete under average conditions with the vacuum-filter, remains to be seen. Much, of course, will depend upon local conditions, such as the site, the utilization of gravity for various operations, water facilities, water supply, and the permeability of the material under treatment, as well as the rapidity with which it yields up its precious metal.

Space will not permit me to touch upon zinc-dust precipitation further than to say that there is every indication that it will eventually take the place of zinc shaving in all plants of large capacity. Electric deposition offers a large and promising field for investigation, but has not as yet been brought to a perfectly satisfactory conclusion. Recent advances in cyanidation have mainly to do with the finer reduction of the product to be treated. The treatment of sand by leaching will probably continue to be the best method in a few instances; but no observer will deny that the trend of modern practice is toward fine grinding, and doing away with leaching—a result made possible by the introduction of the tube-mill and the efficient filtering methods now in vogue.

THE WEIRD THEORIES concerning the forces responsible for the formation of the Grand Cañon of the Colorado that obtain not only among so-called savages but with the half-educated, and those whose existence is given up wholly to money-grubbing, are amusingly set forth by A. R. Crook, curator of the Illinois State Museum of Natural History, in the current issue of *Popular Science Monthly*. The god-made notion of the Indians, while grotesque, is probably shared by many worthy individuals of lighter complexion. A Chicago business man, who thinks in dollars opines that "once there was a gigantic volcano; it exploded with such fury that one side became the finest dust and the other toppled over and now forms the channel through which the river is flowing." Within hailing distance of the truth are the ideas of Joaquin Miller. He suggests that the cañon is due to an underground river that bored its way through the lower strata, as the Green river has done in the Mammoth Cave, of Kentucky. The falling in of the roof caused the cañon. The geologist has long been satisfied that the Colorado river alone was responsible for the immense ravine.

THE Lake Superior region is unique in its lodes of native copper; the metal has been found elsewhere in a native state, but the occurrences have been of no importance. Such ore occurs in Oregon and in Alaska.

A Short Method for Iron.

Written for the MINING AND SCIENTIFIC PRESS
By EDGAR B. VAN OSDEL.

The prevalent methods of iron determination by permanganate and bichromate leave little if anything to be desired. The only appreciable source of error is the liability to oxidation of the solution after reduction and before titration. If this reduction could be performed instantaneously immediately previous to titration this error would be partly eliminated and a great saving in time be at the same time gained.

The scheme suggested is to dissolve the precipitated ferric hydrate in one to three of hydrochloric acid, add three or four grams of potassium iodide crystals and titrate immediately with sodic thiosulphate solution using starch indicator. The reaction is

$$Fe_2Cl_6 + 2KI = 2FeCl_2 + 2KCl + I_2$$

in the presence of HCl and the free iodine dissolved in potassium iodide is titrated by the thiosulphate according to the usual reaction. Sutton gives this method, but suggests that prolonged digestion with the potassium iodide is necessary. It must be evident that this would result in too high results, as the iron chloride once reduced would be re-oxidized by the air and again liberate iodine. I have tried the method at various temperatures and found the reaction to be complete in the cold and instantaneous, provided sufficient hydrochloric acid is present.

The starch-iodine color will return very soon after the finish of titration and is due to re-oxidation of the iron by the air and subsequent liberation of more iodine. It must be disregarded. The solution from which the iron was precipitated as hydrate must have had sufficient oxidation by nitric acid, potassium chlorate, bromine water or the like in order to insure complete precipitation.

Arsenic, antimony, and tin must be eliminated and this can be done easily by a previous precipitation of the iron by ammonium sulphide. Lead will usually have been removed by sulphate precipitation and bismuth occurs so rarely that notice will not be taken of it here. The standard of thiosulphate for iron will be to the copper standard as their atomic weights—that is, 56:63, since either will liberate two atoms of iodine.

The writer has had such satisfactory experience with this scheme that he hopes others will try it and report its weaknesses.

THE EARTH'S INTERIOR.—It has been suggested by Mr. F. W. McNair, president of the Michigan College of Mines, that the Salton Sink affords the possibility of testing the sub-stratum of the earth, that is, whether it be a viscous fluid or a plastic solid. This suggestion is quoted by Mr. Alfred C. Lane, State Geologist of Michigan, in a recent issue of Science. The Colorado river is about to cover some 2,000 square miles in the next 30 or 40 years with water over 200 ft. deep. Will this gradually applied extra load produce a gradual depression? This might almost seem a crucial test, and it would seem as though a few well-placed and well-determined bench marks on projecting hills, or possibly triangulation tripods, in the area to be submerged would answer the question. Of course, if the efforts now being made to divert the Colorado river to its old bed should succeed, this geologic experiment on a gigantic scale will not be available.

WE are no longer bound to limit our estimate of the energy due to the radiant heat of the sun and the internal heat of the earth by previously known dynamical considerations, hence the limit of the ages which the physicist could allot to the evolutionist has undergone profound modification.

Metallurgical Accounts, II.

Written for the MINING AND SCIENTIFIC PRESS
By PHILIP HENRY ARGALL.

PARTING PLANT.—The items to be charged against the Parting Plant would be:

1. Cost and value of all receipts.

2. Labor employed by the Parting Plant from the time Doré bullion is received from the Refinery until its contents in fine ounces of gold and silver, or by-products, have been shipped or returned to one of the other departments for re-treatment.

3. All tools and supplies used in all work in connection with the Parting Plant.

4. Cost and maintenance of machinery, furnaces, etc., used by the Parting Plant.

5. Proportion of power and lighting.

6. Proportion of miscellaneous and general items used in common by the whole of the plant.

The Parting Plant, like the Smelting and Refinery Plants, receives bullion from outside sources, which necessitates the keeping of a Parting Plant Receipt Book, Fig. 12. As in the other cases, a permanent record is kept by the foreman, and a carbon copy forwarded to the office each morning for entry or filing, as may be the case. In many cases bars received by the Parting Plant are not fine enough in gold and silver to be used by that department, and therefore have to be sent to the cupels (Refinery). The Parting Plant will show such bars as a receipt on the daily form, but will also show that they have been sent to the Refinery in the Remark column, so that they may be debited directly on the official records to that department, and so save cross-entries when they are taken up in the Receipt form of the Refinery. Weight, number of bars, marks, name of shipper, bar number, etc., will be filled in on the Weight & Assay Form before being sent to the Laboratory, by the Parting Room foreman. When the fineness has been added by the assayer, the form will be sent in to the office. Bars that had been sent to the Refinery would receive the attention of the Refinery foreman. Doré received from the Refinery is shown on Receipts Report, which serves as a check on the figures reported by the Refinery.

The next report from the Parting foreman is his Operating Sheet as shown on Fig. 13, which has to be sent in every morning. With the exception of a report from the general foreman of the plant, covering the operations of the yard-gang, Fig. 14, the Parting Plant Daily Operating Sheet completes the daily reports for entry into the official records, and to make up the General Daily Operating Record, from which, in turn, is made the general manager's Daily Report.

The Daily Operating Reports sent in each morning to the metallurgical clerk are required, first, to show the total daily operations of the plant, the operations per week, and per month, and so on; and second, for the preliminary entries in the permanent metallurgical records. The metallurgical clerk, or assistant, each morning first thing, on receipt of the daily reports, proceeds to make up the Daily Operating Record, Fig. 15, from which the Daily Operating Report is copied for the general manager, Fig. 16.

The general manager's Daily Operating Report closes the plant reports. It must be borne in mind that many of the figures, such as weights of ore roasted, smelted, etc., as shown on the reports from the various foremen, include moisture, and therefore can only be accepted as approximate, but the quantity of fuels and fluxes used, as

Fig. 18. ORE PURCHASE STATEMENT.

Name ..... Date .....
Class of Material ..... Lot No. ..... No. of Bags ..... Brand .....

	lb.		ASSAY.					
Gross weight								
Sacks		Gold	oz.	Silver	oz.	Lead	%	Copper %
Nett								
Less H_2O								
Net dry weight			PRICES.					
		Gold		Silver		Lead		Copper

Gold, oz.			Value Gold per ton ore.	
Less				
Balance	@			
Silver, oz.			Value Silver per ton ore.	
Less				
Balance	@			
Lead, %			Value Lead per ton ore.	
Less				
Balance	@			Value Metals per ton ore.
Copper, %			Value Copper per ton ore	
Less				
Balance	%			
LESS TREATMENT CHARGE.				Value per ton.
	Tons	@	Value per ton per ton	
Less charges				Total value to shipper.
Freight			Itemized charges to be deducted.	
Duty				
Wharfage				
Bags				
Sampling				Total charges to be deducted.
Miscellaneous				
		Amount due shipper		
.....(Perforated line).....				
MARGIN TAG.				
Lot No.....				
Net Dry Weight	Name of Shipper.....		Month account	of .....

Assay.	Contents.	Price for Margins.	Value of contents.	
Gold	Gold		Value of Gold.	
Silver	Silver		" " Silver.	
Lead	Lead		" " Lead.	
Copper	Copper		" " Copper.	Total value of contents.
	Amount paid shipper. Charges paid			Total cost.
		Total margin		
		Margin per ton		

Fig. 13. PARTING ORERATING RECORD.

Date.....

Bar Number.....	Contents.		Distribution.		Production.		Copper Used.		Fuel Used.....	Fluxes Used.....	Acid Used.		Men Employed.....	Rate of Pay.....	Remarks.
	Au	Ag	Mixing.	Pots.	Fine Au	Fine Ag	No. of Plates.	Weight, lb.....			No. of Drums	Weight, lb.....			

Fig. 17. ORE PURCHASE RECORD.

Date Rec'd	Number of Lot	Name of Consignor.	Class.....	Number of Bags	Weight. Gross..... H_2O..... Net.....	Assay. Au..... Ag..... Pb..... Cu.....	Analysis. SiO_2..... FeO..... CaO..... MgO..... MnO..... Al_2O_3..... Zn.....	Contents. Au..... Ag..... Pb..... Cu.....	Cost. Paid Shipper	Freight	Charges.....	Total Cost.	Cost Per Ton.....	Margins. Total.....	Per Ton	Value of Contents. Au.....	Ag.....	Pb.....	Cu.....	Total.....	Allocation. Bin.....	Mix.....	Folio Ore Purchase Statement Book.

shown on such reports should be as exact as it is possible to get them, but here again it must also be borne in mind that such materials increase, or decrease, in weight, according to the season of the year, and the quantity of moisture they lose, or take up. Adjustments at a later period are therefore necessary, but the reports serve the purpose of giving a clear and comprehensive idea of what the plant is doing from day to day; they serve to curtail expenses, and the work of each foreman is brought directly under the eye of the superintendent; additional labor employed is at once noticed, and the reason requested, and the superintendent is thus able to keep in touch with the work of every part of the establishment.

Fig. 12. PARTING PLANT RECEIPTS.

Date.....

Number of Bar.	Name of Consignor.	Weight.		Remarks.

Fig. 14. YARD-GANG REPORT.

No. of Foremen..... Rate of Pay..... Date.....

Work Employed on	No. of Men	Rate of Pay
Sampling		
Roasting		
Briquetting		
Blast Furnaces		
Refinery		
Parting		
Shipping		
General		

Fig. 24. STORE ORDER.

Date.....

Dept. required.....

Material.	Quantity.	Work to be used on

.....

Received above goods Foreman.

.....

Receiver.

Fig. 23. POWER DISTRIBUTION.

For Month ending.....

Departments.	Horse-Power Hours. Steam.	Electrical.
Sampling		
Crushing		
Roasting		
Briquetting		
Blast-furnaces		
Refinery		
Blue vitriol plant		
Parting		
Total		

.....

Chief Engineer.

Fig. 26. TIME CHECK.

Date.....

If not handed in when employee goes off shift, pay will be forfeited.

Approved

..... Foreman. ..... Employee.

Fig. 15. **DAILY OPERATING RECORD.**

Date.....

SAMPLING.

Material.	Today	This Month
Sulphides, tons		
Quartz, "		
Lead ores, "		
Limestone, "		
Ironstone, "		
Coke, "		
Coal, "		
Men employed		
Amount of pay		

MIXTURES BUILT.

Mix No.	Today.	This Month.

CRUSHING.

Material.	Today	This Month
Ore, tons		
Matte, tons		
Men employed		
Amount of pay		

BRIQUETTING.

Ore briquetted		
Matte briquetted		
By-product, etc., briq'd		
Lime used		
Men employed		
Amount of pay		

ROASTING.

Furnace Number	Material.	Number of Charges	Average Weight of Charge.	Ore. Today.	Ore. This Mo.	Matte. Today.	Matte. This Mo.	Total. Today.	Total. This Mo.	Sulphur After Roasting, %	Fuel. Today.	Fuel. This Mo.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

Furnace Days. Today	Furnace Days. This Mo.	Men Employed. Today	Men Employed. This Mo.	Amount of Pay. Today	Amount of Pay. This Mo.

SMELTING.

	No. 1 Furnace. Ore Run Today	No. 1 Furnace. Ore Run This Mo.	No. 1 Furnace. Matte Run Today	No. 1 Furnace. Matte Run This Mo.	No. 2 Furnace. Ore Run Today	No. 2 Furnace. Ore Run This Mo.	No. 2 Furnace. Matt Run Today	No. 2 Furnace. Matt Run This Mo.	No. 3 Furnace. Ore Run Today	No. 3 Furnace. Ore Run This Mo.	No. 3 Furnace. Matte Run Today	No. 3 Furnace. Matte Run This Mo.	Totals. Ore Run Today	Totals. Ore Run This Mo.	Totals. Matte Run Today	Totals. Matte Run This Mo.
SMELTED: Ore																
Matte																
By-Products																
Limestone																
Total Ore — Matte, By-Products, Limestone																
Slag																
Iron																
Total smelted																
PRODUCED: Bullion																
Matte																

Analysis of Slag Dumped.	Ore Run %	Matte Run %
Au		
Ag		
Pb		
Cu		
SiO_2		
FeO		
CaO		
MnO		
MgO		
Al_2O_3		
Zn		

Charge Contents.	Ore Run %	Matte Run %
Pb		
S		
Coke		
Fe		
Slag Resmelted		

Assay and Percentage of Matte Produced.	Ore Run. Today	Ore Run. % of Smelted.	Ore Run. Average for month	Matte Run. Today	Matte Run. % of Smelted.	Matte Run. Average for Month
Au						
Ag						
Pb						
Cu						

	Today	This Mo.
Number of Men Employed		
Amount of Pay		

Number of blowers in use.

Average pressure .....

	Charges No.	Weight Charged. Today	Weight Charged. This Month.	Zinc Used. Domestic Today	Zinc Used. Domestic This Month.	Zinc Used. Foreign Today	Zinc Used. Foreign This Month.	Materials Produced. Desilverized Lead Today	Desilverized Lead This Month.	Zinc Crust Today	Zinc Crust This Month.	Dark Skimmings. Today	Dark Skimmings. This Month.	Antimonial Skimmings. Today	Antimonial Skimmings. This Month.	Gold. Before	Gold. After	Silver. Before	Silver. After	Fuel Used. Today	Fuel Used. This Month.	Men Employed. Today	Men Employed. This Month.	Amount of Pay. Today	Amount of Pay. This Month.
Blast Furnace Sweater.	1																								
	2																								
	3																								
	4																								
Total																									
No. 1 Softener.	1																								
	2																								
	3																								
	4																								
No. 2 Softener.	1																								
	2																								
	3																								
	4																								
No. 3 Softener.	1																								
	2																								
	3																								
	4																								
Total																									

RETORTS.

	Today	This Month
Number used		
Total charges		
Quantity charged, lb		
Cupelled bullion produced — Au		
Assay — Ag		
Zinc recovered, lb		
Retort dross produced		
Fuel used		
Men employed		
Amount of pay		

MARKET-LEAD KETTLES.

	1 Today	1 This Mo.	2 Today	2 This Mo.	3 Today	3 This Mo.
Weight charged						
Time began						
Time finished						
PRODUCTION— Refined lead						
Yellow skimmings						
Silver — before						
after						
Fuel used						
Men employed						
Amount of pay						

ANTIMONY FURNACE.

	Today	This Month
Number of charges		
Quantity charged, lb		
Bullion produced, lb		
Assay bullion, Au		
Ag		
Pb		
Slag produced, lb		
Coal dust used, lb		
Fuel used		
Men employed		
Amount of pay		

CUPELS.

	1 Today	1 This Mo.	2 Today	2 This Mo.	3 Today	3 This Mo.	4 Today	4 This Mo	5 Today	5 This Mo.	6 Today	6 This Mo.
REFINED—Retort bullion												
Base bullion												
Silme etc												
Dore produced, oz												
Assay Dore—Au												
Ag												
Litharge produced												
Fuel used												
Men employed												
Amount of pay												

PARTING.

	Today	This Month
Amount parted, oz		
Fine Au produced		
Fine Ag produced		
Copper plates used		
Acid used		
Fuel used		
Fluxes used		
Slum produced		
Men employed		
Amount of pay		

SHIPMENTS.

	Today	This Month
Refined lead, tons		
Fine gold, oz		
Fine silver, oz		

Total No. men employed

Total cost labor .....

Fig. 16. SUPERINTENDENT'S DAILY OPERATING RECORD.

Total number of men employed
Total cost of labor

Date .....

Sampling.	Mixtures Built.			Crushing.
Sulphide ore—tons	No.	Class.	Weight.	Ore, tons .....
Quartz " "				Matte, tons .....
Lead " "				Men employed .....
Iron " "				Roasting.
Limestone "				Ore, tons .....
Coke "				Matte, tons .....
Coal "				Fuel used .....
Men employed	Men employed.			No. of furnaces .....
				Men employed .....

BRIQUETTING.

Ore Briquetted.	Matte Briquetted.	By-Products Briquetted.	Lime Used.	Number of Men Employed.

BLAST FURNACES.

Furnace Number.....	Materials Smelted.							Materials Produced.		Assay and Analysis.															Men Employed.
										Bullion		Matte.			Slag.										
	Ore.	Matte.	By-Products.	Lime.	Coke.	Slag.	Iron.	Bullion.	Matte.	Au	Ag	Ag	Cu	Pb	Ag	Pb	Cu	SiO_2	FeO	CaO	MnO	MgO	Al_2O_3	Zn	

REFINERY.

Material Refined.			Products Produced.		Assays.				Fuel Used.
					Doré.		Lead.	Number Men Employed.	
Blast Bullion.	Foreign Bullion.	Slime, etc.	Doré.	Refined Lead.	Au	Ag	Pb		

PARTING PLANT.

Material Parted.		Material Produced.		Fuel Used.	Fluxes Used.	Acid Used.	Copper Plates Used.	Men Employed
Foreign.	Domestic.	Fine Au.	Fine Ag.					

SHIPMENTS.

Fine Gold.	Fine Silver.	Refined Lead.

Fig. 22. FUEL AND FLUX RECORD.

Date received.	Coal, tons.	Coke, tons.	Limestone, tons.	Ironstone, tons.	Oil, bbl.	Copper Plates.		Sulphuric Acid.		Zinc.	Burnt Lime.	
						No.....	Lb.....	No.....	Lb.....		No. bbl.	Lb.....
Total												
Boilers												
Roasters												
Briquetting												
Smelting												
Refinery												
Parting												
Balance												

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

The Supreme Court of Michigan decided that the mine owner was not liable to a miner for an injury which occured by a miner being struck by a car coming out of a gallery and down to the shaft by force of gravity, having been permitted to do so by an act of an intermeddler or miner in the gallery; and where it was proved that no car had ever so come out before.

Sommers *v.* Standard Min. Co., 109 N. W. 30.

The Revised Statutes of the United States provide that where a vein or lode is known to exist within the boundaries of a placer claim, an application for a patent for such placer claim that does not include an application for the vein or lode claim, shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim, but where the existence of the vein or lode is not known, a patent for the placer claim shall convey all the minerals within its boundaries. Under this statute the Supreme Court of California in a recent case said: "The decisions of the Supreme Court of the United States and of other Courts of high authority, both State and Federal, have settled the construction of this provision of the Revised Statutes, and of these reservations in placer patents as applied to a great variety of cases, and especially as they apply to this case. A vein known to exist within the boundaries of a placer claim at the date of the application for patent, and not included in the application, may be located by an adverse claimant after the issuance of the patent, and a vein is known to exist within the meaning of the statute (1) when it is known to the placer claimant; (2) when its existence is generally known; (3) when any examination of the ground sufficient to enable the placer claimant to make oath that it is subject to location, as such would necessarily disclose the existence of the vein.

And in the same case the Court further said in commenting on the value of a quartz vein, and the sufficiency of proof to establish the alleged claim: "A quartz vein which contains so small a percentage of gold, silver, etc., as to be of no value for mining purposes is not a known vein within the meaning of the law, and whether it is of any practical value is always a question for the jury. In this case there was not only failure on the part of the plaintiff to prove that any of the veins claimed by him could ever be expected to pay the cost of extraction of the ore, but there was, on the contrary, a preponderance of evidence that, at the date of the application for the placer patents, they were generally regarded as valueless, and have since proved to be so. Upon this ground, therefore, if upon no other, the finding against the plaintiff's claim of ownership is clearly supported by the evidence.

Mutchmor *v.* McCarthy, 87 Pac. 85.

The rule has been established by the Courts that so long as a prior location of a mining claim is subsisting, no rights in any of the ground covered by such claim can be acquired by a junior locator.

Porter *v.* Tonopah North Star Tunnel &c. Co., 133 Fed. 756.

Where a person sought to establish title to lode claims which were mostly re-locations of abandoned claims, and he failed to show actual possession prior to the commencement of the action, the doing of the requisito assessment work, or that there existed within the reasonable boundaries of any of the claims a vein or deposit of ore sufficiently valuable to pay the cost of extraction or the cost of reduction, the Court decided that the claims were invalid. It is the rule that a quartz vein which contains so small a proportion of gold, silver, or other valuable mineral as to be of no value for mining purposes, is not a new vein within the meaning of the United States statutes providing for the disposition of mining claims.

Mutchmor *v.* McCarthy, 87 Pac. 85.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock from O. B. A. of Beowawe, Nev., is Rhyolite.

The three specimens from Cordova, Alaska, marked O. M., are metamorphic rocks containing garnet.

The two specimens from Nevada City marked J. H. R. are: No. 1, Epidote, a lime-alumina-silicate; No. 2, Gneiss.

M. E. P. of Alamo, Baja California, Mex., sends the following: No. 1, Magnetite; No. 2, Magnetite and Feldspar; No. 3, Quartz with Chlorite; No. 4, Hornblende Schist; No. 5, Quartz and Orthoclase Feldspar, a quartz-porphyry; No. 6, Quartzite; No. 7, Pegmatite.

Samples from Iron Springs, Ida., marked T. D., are: No. 1, Quartz; No. 2, Quartz, containing much pyrite which has become wholly oxidized to limonite; No. 3, Quartz, containing chalcopyrite and pyrite; No. 4, Quartz, with plates of ilmenite, an oxide of iron and titanium.

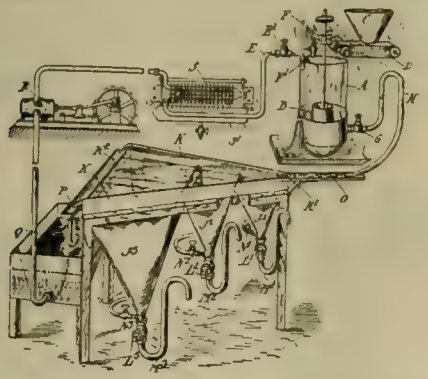
SIEDENTOPF & ZSIGMONDY, investigating the Tyndall experiments on the polarization of light in hydrosols or colloidal solutions, have demonstrated that the dispersion of light is due to the presence of the same particles which influence, and to which are ascribed, the other remarkable properties of the liquids containing them. In the Tyndall experiment a beam of light is sent through the space under observation, the observer looks at the space in a direction perpendicular to the course of the beam. If dust or other fine particles are present in that space, they polarize, disperse, and reflect the light, and the beam is seen. If such particles are absent the beam is invisible and the space is said to be optically empty. Siedentopf & Zsigmondy constructed apparatus to send a beam of great intensity into the medium under investigation, and observed through powerful microscopes. Under such conditions particles of metallic gold in a colloidal gold solution appeared as brilliant sources of light, but their shape could not be determined. The investigators connected the number of these bright spots in a space of known dimensions, and knowing the weight of gold per unit volume of solution, made the following assumptions: That all the gold was visible; that it had the same specific gravity when in the colloidar state when massive; and that the particles were cubes. From these values they calculated the linear dimensions of the individual particles. The smallest particles which they were able to count appeared to have a linear dimension of six millimicrons. The exact dimensions of the individual particles on account of the numerous assumptions may only be approximately correct, nevertheless the feat of counting such small particles is little less than marvelous, inasmuch as the smallest particle visible with the best microscope has a linear dimension of 250 millimicrons.

The new region which these experimenters have brought within the range of direct observation is pregnant with the possibilities of future discoveries, the molecules may ultimately come within the range of the apparatus. Lobry de Bruyn for example estimated the hypothetical diameter of the soluble starch molecule at about five millimicrons, while O. E. Meyer estimated the hydrogen molecule at about $\frac{1}{10}$ millimicron.

MINING AND METALLURGICAL PATENTS.

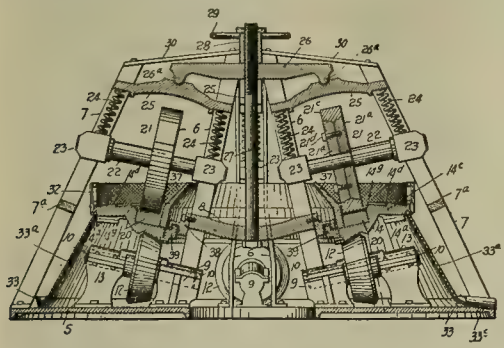
Specially Reported for the MINING AND SCIENTIFIC PRESS.

ORE CONCENTRATION.—No. 835,120.—Henry L. Sulman, Hugh F. Kirkpatrick-Picard, and John Ballot, London, England.



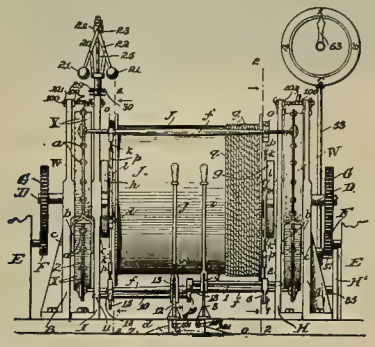
The herein-described process of concentrating ores which consists in mixing the powdered ore with water, adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter (amounting to a fraction of one per cent on the ore), agitating the mixture until the oil-coated mineral matter forms into a froth, and separating the froth from the remainder by flotation.

PULVERIZING-MILL.—No. 835,104; John H. Elspass, Los Angeles, California.



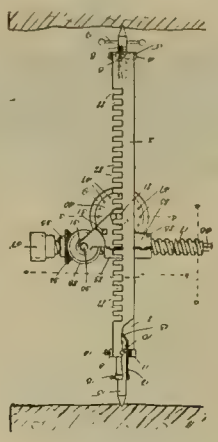
The combination in a pulverizing-mill, of an outer and inner series of posts, an annular revoluble mortar located between said series of posts, rollers supporting the same, means for rotating the mortar, and annular mortar-centering rings carried respectively by the mortar and the inner series of posts, said rings having opposing edges in the surface of a right cone concentric with the mortar-axis.

HOIST.—No. 834,901; Charles E. Glessner, Ouray, Colorado.



In a hoist, the combination of a substantially constant-speed motor, a driving or power shaft continuously driven in one direction from said motor at substantially constant speed, a variable-speed transmission gear for connecting the load to the source of power, comprising a spur-gear and an internally-toothed gear, one of which is connected to the power-shaft and the other being adapted to be connected to the load, a friction-disk having planetary gears meshing with both the spur-gear and the internal gear, and a brake co-operating with said friction-disk whereby the load may be thrown gradually on the motor on starting.

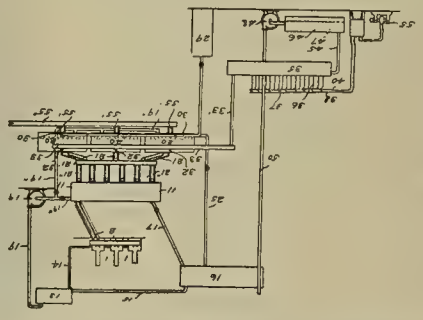
DRILLING MACHINE.—No. 833,189; Richard Wheater, Novinger, Missouri.



In a drilling machine, the combination with a rotary threaded drill-bar, of a worm-wheel constituting a seat therefor, a supporting-shaft for the worm-wheel, a bracket upon the shaft, driving mechanism including meshed gears upon the bracket and the drill-bar, a friction element having a threaded connection with the shaft for adjustment toward and away from the worm-wheel and provided in one face with an annular series of sockets, and a locking-pin carried by the bracket and capable of engagement with any of the sockets to adjustably lock the friction element.

APPARATUS FOR EXTRACTING GOLD.—No. 833,999; Joseph A. Comer, Los Angeles, California.

An apparatus for extracting gold, silver, and other metals from ores by a solution of cyanide of potassium, comprising



a series of settling-tanks communicating with each other, the cyanide-tanks, means for connecting said cyanide-tanks together, means for conveying the cyanide solution from the settling-tanks into the cyanide-tanks and from the cyanide-tanks again into the settling-tanks.

TUNNEL MINER'S POWER-SHOVEL.—No.832,370; Patrick Ford, Chicago, Illinois.

A power-shovel embracing a car having its platform below the axle, a swinging boom extending forwardly therefrom at a slight upward inclination and a dipper having a short dipper-stick operated from said boom, means swinging said boom and a motor on the boom for actuating the dipper.

The Temple-Ingersoll Electric Air-Drill.

By Frank Richards.

This drill solves the perplexing and difficult problem of the employment of electricity for driving rock-drills. The problem may, indeed, be said to be solved indirectly, but none the less satisfactorily and completely. For this drill is not an electric drill, but an air-drill, as completely so as any air-driven drill ever invented, and indeed more so, since this drill cannot be driven by steam. While it is not an electric drill it is still driven by the electric current, which is brought as close to the drill as possible to do the driving, and the drill apparatus when in use anywhere has no connection with its source of power except through the wires that are led to it.

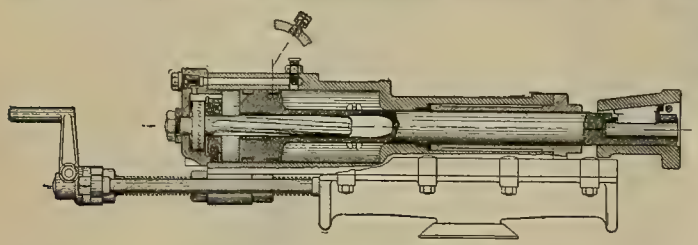


Fig. 2. Sectional View.

Fig. 1 illustrates the Electric Air-Drill when in use, and Fig. 2 is a section exhibiting the construction. There is a drill cylinder quite similar to that of the ordinary air- or steam-driven drill. This cylinder is slid back and forth in a shell by a hand-operated feed-screw, and the shell is mounted upon a tripod, bar, or column in the usual way. The cylinder of this drill, while similar to that of the steam- or air-driven drill, differs from it in important particulars; it has no valves or valve-operating devices, no valve-chest or tortuous ports or passages, no buffers, no yielding springs and fastenings for the heads, nor the equivalents of these parts in any disguise of them. At each end of the cylinder there is simply an ample and free opening to which a hose may be attached. Provision is made for rotating the piston.

So much for the drill itself. Accompanying each individual drill is a little truck, which can be moved around anywhere as easily as the drill itself. Upon this truck are two small vertical single-acting air-cylinders with trunk pistons operated alternately by two cranks on a shaft below them, speed-reducing gears connecting the shaft with a small motor on the same truck. The upper end of one of these compressor-cylinders is connected by a short hose, six or eight feet long, to one end of the drill-cylinder, and the other end of the drill-cylinder is similarly connected to the other compressor-cylinder. It will be seen that the body of air contained in either end of the drill-cylinder, in its companion compressor-cylinder, and in the hose connecting them, has no chance to get out; it remains there constantly, provision being made for supplying leakage losses. Similarly, the two bodies of air in the two ends of the drill-cylinder and in the connections of each have no communication with each other; they remain distinct and intact.

This is the entire apparatus, and the operation is as simple as could be imagined. The air, to begin with, has a normal pressure in both lengths of hose and their connected cylinders of about 30-lb. gauge. If, now, the crank-shaft turns and the piston in one of the air-cylinders advances, the pressure rises in that cylinder and in the end of the drill-cylinder to which it is connected, and, as the compressor-pistons work alternately, the pressure in the other cylinder and in the other end of the drill-cylinder falls, the difference of pressure on the two sides of the drill-piston causing it to make its stroke. When the movement of the compressor pistons is in the other direction the drill-piston makes its return stroke, and in this way, as the crank-shaft turns, the drill-piston makes its complete double stroke for each revolution, and this is kept up continuously as long as the motor runs and drives the cranks. The compressor-cylinders might more properly and less misleadingly be called pulsators, and this name they may in time acquire.

There are a number of important advantages connected with this arrangement. First, the great simplification. All the most complicated and costly parts of the drill are eliminated, such as the valves and valve-operating devices. Lubrication is simple and effective, an important particular in connection with it being that there is no exhaust to scatter the oil, which is used over again the same as the air. But the most gratifying feature in connection with the Electric Air-Drill is the fact that, compared with the standard air-driven drill, it *takes only one-third to one-fourth of the power to drive it.* This is due to the fact that the same air is used over and over, and that all of its electric force is available in both directions, instead of exhausting the charge for each stroke at full pressure.

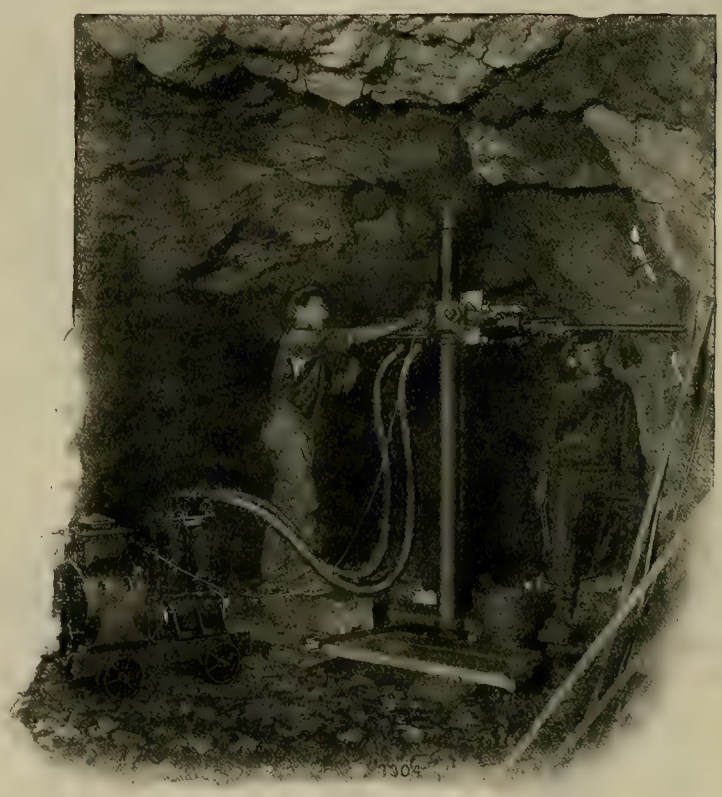


Fig. 1. Drill in Operation.

The builders of the drill, the Ingersoll-Rand Co., of New York, have so assured themselves of the great usefulness of the drill that they have made most elaborate and costly arrangements for manufacture of it. Three years of thorough testing, chiefly in Colorado, have demonstrated that it is a machine invaluable to the miner

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Editorial.

THE COMPLETION of the first volume of *Economic Geology*, representing the eight numbers issued during twelve months, marks the end of the first stage in a most useful undertaking. Geology in its application to mining has secured a valuable friend in this semi-quarterly journal and we join with others in sending cordial congratulations to Mr. John D. Irving, the editor, and to his fellow-workers.

IN this issue we publish the concluding portion of Mr. P. Henry Argall's discussion of 'Metallurgical Accounts,' and while to some of our readers the space devoted to tabular statements may have appeared excessive, it will not seem so to smelter men, by whom the value of the article will be fully appreciated.

THE LONDON financial papers contain accounts of Le Roi annual meeting, which amounted to a vindication of Mr. Anthony J. McMillan, the managing director, for a dividend at the rate of 3½ per cent was declared, good reports from the mine were submitted, and Mr. McMillan's friends were re-elected directors, and he was heartily thanked for his successful efforts.

IN ENGLAND also there is agitation for a Mines Department and recently a deputation consisting of the members of the Royal Commission on Coal Supplies called upon the Home Secretary in regard to it. A bureau subordinated to the Home Office is not considered enough and it is urged that there be created a separate department, as is the case with agriculture, and woods and forests. *The Mining Journal* has advocated such a step for many years and we congratulate our London contemporary on the prospects of success, for the Home Secretary made an encouraging response to the deputation mentioned.

APPARENTLY we are "thru" with the effort to impose spelling reform by ukase. Congress has voted "to adhere to the standard of orthography prescribed in generally accepted dictionaries of the English language." For this relief, much thanks. In the meanwhile, we do not envy the feelings of those hasty editors, who, mainly to obtain notoriety, accepted the unauthorized dictum of the Spelling Board, even though supported in a characteristically impulsive manner by Mr. Roosevelt. Spelling reform will come not *per saltum*, nor by ukase, nor by a self-constituted committee, but by the usage adopted in the columns of the leading newspapers of the English-speaking world and those are *The Times* of London, *The Evening Post* of New York, the *Star* of Montreal, the *Argus* of Melbourne, and a few others.

Leasing Discredited.

The leasing system has been responsible for the successful development of many mines and even of mining districts. In Clear Creek and Gilpin counties, Colorado, it has kept alive those mining centres during times of depression, and it has revived mines apparently exhausted of their ore reserves. Later, at Cripple Creek, lessees have proved themselves good prospectors underground, and economic operators at surface. Here, also, when the engineers and managers of several mines had come to the conclusion that operations by the company could no longer be profitable, the old workings have been leased to enterprising groups of miners, usually with favorable concessions in case of exploratory work in new ground. This policy has justified itself. At Stratton's Independence, especially, after the highly technical management had confessed that they could no longer earn dividends, the big mine was subdivided into leases and the result was a profit in royalties of $500,000 per annum. But here comes one of the darker sides of the subject, for it is fairly certain that some—it is impossible to estimate how much—of this phenomenal success in finding ore by the lessees was due to the concealment of rich streaks cut by them while in the employ of the company and that their ability to get on the track of rich ore was not all to their credit as miners. On the whole, however, it is fair to say that in many big mines the company's engineers and superintendents do not spend enough time underground, and thus they render possible these *caches* that become the plums of lessees subsequently. In districts where veins are rich, small, and erratic, systematic exploration is less successful than constant watching of signs and changes understood by experienced miners, so that the leasing system becomes best suited to the local conditions. Such is the case in the new goldfields of Nevada, where many of the best discoveries are due to lessees. At Goldfield particularly many of them have made fortunes, by their enterprise, their luck, and by their skill also. There the lodes are not necessarily small, but they are rich, often ill-defined, and frequently erratic, so that the miner must keep his nose to the streak. The mine owners of Nevada owe a great deal to the leasing system and it is regrettable therefore that it is being discredited at this time by the practices current at Goldfield. Owing to the near expiration of some of the best leases, there has been a great hurry to get out the rich ore, with the result that the mines are being deliberately gutted. At the same time timbering has been neglected until there is danger of fatal accidents, and ore stealing has become general. As the lessees cannot run the risk of a strike by compelling a search of the mine workers, they have made no effort to stop pilfering. At the Selby smelter there are 68 sacks of ore valued at $100,000 from the Mohawk mine, for which suit has been begun (by the company owning the mine) on the ground that it was stolen. It is claimed that as much as $300,000 has been taken from this property alone during the past month by ore thieves, employed as miners. The lessees are aware of the identity of some of the men but dare not discharge them, for fear of a strike. Such a state of affairs is highly discreditable. The lack of timbering and the obvious absence of proper supervision could be corrected by a State Mine Inspector, as was done at Cripple Creek, where the Bureau of Mines did excellent service in this regard. Certainly, it is not a pleasant picture to contemplate, of mines operated by a mob beyond the control of the responsible parties and of leasing methods that have degenerated into mere gophering. In every respect it is contrary to the best traditions of mining.

Reform and Education.

In this issue, under 'By the Way,' a page reserved each week for notable statements by thoughtful men, we publish a portion of the President's message to Congress. Mr. Roosevelt is always interesting, and he is so thor oughly in touch with the better spirit of the country of which he is the chief executive, that his utterances invariably command attention. The portions we have selected deal with the relations between labor and capital, and systematic education. His arraignment of sinister demagogues obviously refers to one of them in particular who received a severe lesson during the recent election, but it applies to a good many others who make a business of being reformers. Certainly nothing is worse for a great industrial community than the breeding of hatreds and misunderstandings between employers and employed. From the standpoint of mining we know that economical work cannot be done unless there is a certain feeling of confidence and respect between the manager and his men. Strikes and lock-outs are due too often to the sudden promotion of those who never learned to obey and are therefore not likely to know how to command. Mutual consideration is necessary if the vast machinery of industrial progress is to work smoothly. The President says what he has to say in a plain way and it will be well to read his statement carefully. In regard to education, in particular the systematic education that is to bring about national "success," he speaks with equal conviction, but we are not so certain but that the people of these United States need advice how to be happy just as much as they do how to be effective—when effectiveness is measured solely by bread-winning and money-getting capacity. There are plenty of people to advocate a sound technical education and there are so few to emphasize the fact that the size of a salary is neither the measure of a man's happiness nor of his usefulness; therefore we venture to make a plea for the broad education—as against mere instruction—that makes better citizens and better heads of families, that makes all-around men instead of narrow specialists with a capacity to gather shekels from under the feet of opportunity. We have reached a measure of industrial effectiveness far ahead of Europe and we have paid for it—as everything worth having is paid for—in the loss of some of the things that make for happiness. The instruction that makes clever engineers and ingenious mechanics is worth something, but the education that cherishes moral worth and teaches youth to think clearly is worth more.

By the Way.

In his recent message to Congress, the President said:

As a nation we still continue to enjoy a literally unprecedented prosperity; and it is probable that only reckless speculation and disregard of legitimate methods on the part of the business world can materially mar this prosperity.

In dealing with both labor and capital, with the questions affecting both corporations and trades unions, there is one matter more important to remember than aught else, and that is the infinite harm done by preachers of mere discontent. These are the men who seek to excite a violent class hatred against all men of wealth. They seek to turn wise and proper movements for the better control of corporations and for doing away with the abuses connected with wealth, into a campaign of hysterical excitement and falsehood in which the aim is to inflame to madness the brutal passions of mankind. The sinister demagogues and foolish visionaries who are always eager to undertake such a campaign of destruction sometimes seek to associate themselves with those working for a genuine reform in governmental and social methods, and sometimes masquerade as such reformers. In reality they are the worst enemies of the cause they profess to advocate, just as the purveyors of sensational slander in newspaper or magazine are the worst enemies of all men who are engaged in an honest effort to better what is bad in our social and governmental conditions. To preach hatred of the rich man as such, to carry on a campaign of slander and invective against him, to seek to mislead and inflame to madness honest men whose lives are hard and who have not the kind of mental training which will permit them to appreciate the danger in the doctrines preached—all this is to commit a crime against the body politic and to be false to every worthy principle and tradition of American national life. Moreover, while such preaching and such agitation may give a livelihood and a certain notoriety to some of those who take part in it, and may result in the temporary political success of others, in the long run every such movement will either fail or else will provoke a violent reaction, which will itself result not merely in undoing the mischief wrought by the demagogue and the agitator, but also in undoing the good that the honest reformer, the true upholder of popular rights, has painfully and laboriously achieved. Corruption is never so rife as in communities where the demagogue and the agitator bear full sway, because in such communities all moral bands become loosened, and hysteria and sensationalism replace the spirit of sound judgment and fair dealing as between man and man. In sheer revolt against the squalid anarchy thus produced men are sure in the end to turn toward any leader who can restore order, and then their relief at being free from the intolerable burdens of class hatred, violence, and demagogy is such that they cannot for some time be aroused to indignation against misdeeds by men of wealth, so that they permit a new growth of the very abuses which were in part responsible for the original outbreak. The one hope for success for our people lies in a resolute and fearless, but sane and cool-headed, advance along the path marked out last year by this very Congress. There must be a stern refusal to be misled into following either that base creature who appeals and panders to the lowest instincts and passions in order to arouse one set of Americans against their fellows, or that other creature, equally base but no baser, who in a spirit of greed, or to accumulate or add to an already huge fortune, seeks to exploit his fellow Americans with callous disregard to their welfare of soul and body. The man who debauches others in order to obtain a high office stands on an evil equality of corruption with the man who debauches others for financial profit; and when hatred is sown, the crop which springs up can only be evil.

The plain people who think — the mechanics, farmers, merchants, workers with head or hand, the men to whom American traditions are dear, who love their country and try to act decently by their neighbors, owe it to themselves to remember that the most damaging blow that can be given popular government is to elect an unworthy and sinister agitator on a platform of violence and hypocrisy. Whenever such an issue is raised in this country nothing can be gained by flinching from it, for in such case democracy is itself on trial; popular self-government under republican forms is itself on trial. The triumph of the mob is just as evil a thing as the triumph of the plutocracy, and to have escaped one danger avails nothing whatever if we succumb to the other. In the end the honest man, whether rich or poor, who earns his own living and tries to deal justly by his fellows, has as much to fear from the insincere and unworthy demagogue, promising much and performing nothing, or else performing nothing but evil, who would set on the mob to plunder the rich, as from the crafty corruptionist, who, for his own ends, would permit the common people to be exploited by the very wealthy. If we ever let this Government fall into the hands of men of either of these two classes we shall show ourselves false to America's past. Moreover, the demagogue and the corruptionist often work hand in hand. There are at this moment wealthy reactionaries of such obtuse morality that they regard the public servant who prosecutes them when they violate the law, or who seeks to make them bear their proper share of the public burdens, as being even more objectionable than the violent agitator who hounds on the mob to plunder the rich. There is nothing to choose between such a reactionary and such an agitator; fundamentally they are alike in their selfish disregard of the rights of others, and it is natural that they should join in opposition to any movement of which the aim is fearlessly to do exact and even justice to all.

It is probable that a thoroughly efficient system of education comes next to the influence of patriotism in bringing about national success of this kind. Our federal form of government, so fruitful of advantage to our people in certain ways, in other ways undoubtedly limits our national effectiveness. It is not possible, for instance, for the National Government to take the lead in technical industrial education, to see that the public-school system of this country develops on all its technical, industrial, scientific, and commercial sides. This must be left primarily to the several States. Nevertheless, the National Government has control of the schools of the District of Columbia, and it should see that these schools promote and encourage the fullest development of the scholars in both commercial and industrial training. The commercial training should in one of its branches deal with foreign trade. The industrial training is even more important. It should be one of our prime objects as a nation, so far as feasible, constantly to work toward putting the mechanic, the wageworker who works with his hands on a higher plane of efficiency and reward, so as to increase his effectiveness in the economic world, and the dignity, the remuneration, and the power of his position in the social world. Unfortunately, at present the effect of some of the work in the public schools is in exactly the opposite direction. If boys and girls are trained merely in literary accomplishments, to the total exclusion of industrial, manual, and technical training, the tendency is to unfit them for industrial work and to make them reluctant to go into it, or unfitted to do well if they go into it. This is a tendency which should be strenuously combated.

Special Correspondence.

Johannesburg, Transvaal.

Secret Reserves.—Gold Production Increasing.—Interesting Details. —The Rand at Its Zenith.—Coolie and Native Labor.—The Diamond Boom.

A complete change has come over the Rand, as far as reserve gold is concerned. In last month's returns almost every producing mine published the amount of gold held in reserve. Not many mines are without a reserve. The amounts differ a great deal, from a hundred or so ounces on the poor mines, to 10,000 oz. on the rich mines of the Central Rand. Now that everything is made public, there is not much use to have a reserve at all. People seem to think it sacrilegious to use any of the reserve. They consider it something to look at. A decrease in reserve is contemplated with more apprehension than a fall in profits. Provided the reserve is not abused, as it never has been on the Rand, there is no reason why it should not be secret. It is almost impossible to keep the profits uniform without a reserve.

The returns for October show that another record is established for the Transvaal. The figures show that the total production, inclusive of 14,968 oz. gold reserves,



Map of South Africa.

was 540,609 oz. fine gold, of the value of £2,296,361, which is an increase compared with the September yield of 35,498 oz., valued at £150,786. October results present several features of interest. Two groups, Albu and Goerz, have declared all their reserve gold as profits, and in future will have no reserve. A remarkable record was made by the premier gold producer, the Simmer & Jack, which in October turned out gold to the value of £100,157. This mine is run almost entirely with coolie labor, and the splendid results obtained show what a success the Chinese are. During the month there were at work 8,370 stamps in the Transvaal, an increase of 55 over September. Of the total, 7,975 stamps were working on the Rand and 395 in outside districts. The three leading producers in October were the Simmer & Jack mine, which with 320 stamps crushed 62,010 tons, for a value of £100,157; the Robinson mine, with 210 stamps turned out £91,237; the Cason, which with 220 stamps crushed 36,500 for a recovery of £77,564. The amount of waste rock sorted out varied a great deal on the different mines, from no sorting in the case of the Langlaagte Consolidated, to 29% in the case of the New Rietfontein mine.

Many people speculate how much longer this breaking of records can continue. Before long one producer at least on the Central Rand will fall out of line. A few of the big producers will soon enter the down-grade in production. New mines will come forward, to be sure, but as the deep levels are poorer than the outcrops, the outlook for continued record-breaking is not bright. The Rand is probably near its zenith now, as a gold producer. As regards native labor, the figures furnished by the Chamber of Mines for October disclose an improvement in the number of natives distributed compared with time expired and wastage. The number of natives employed at October 31 was 80,316 as compared with 77,858 in September, and 76,246 at the end of August. Of Chinese indentured labor 52,080 were in the employ of mines on August 31, 53,400 at the end of September, while on October 31 the number returned was 53,134.

The diamond boom continues. Syndicates for the exploitation of diamonds are formed nearly every week, there is a 'flare up' for a week or so, and then the thing collapses. The Orange River Colony is the favorite hunting ground for the diamond promoters, on account of the favorable diamond mining law in that region. Some of these syndicates have been out and out swindles, but so far there have been no prosecutions. In this diamond flutter the public seem content to consider any hole in the ground a diamond mine, whether it contains gem-stones or not.

Joplin, Missouri.

Production of Zinc and Lead Ore.—Shortage of Cars.—Thomas C. Co. Doing Well.—New Company Formed to Prospect.—Several Strikes of Ore.—General Activity and Prosperity.

The highest price reported paid for zinc ore last week was $49.70 per ton for the ore from the Engineers Zinc Co. at Webb City. The highest price reported paid for lead ore was $84 per ton, a weakening of $1.50 as compared to the price of the previous week. The zinc ore shipment last week shows an increase of 450 tons and of lead ore 11 tons over the previous week, with an increase in value of $16,390. Compared with the same week last year the shipment is 403 tons of zinc greater and 69 tons of lead less, with a gain in value of $10,800. The shipments last week were: Zinc ore, 10,585,140 lb., valued at $231,800; lead ore, 1,331,050 lb., valued at $54,060; combined value, $285,860. For the 49 weeks the shipments have been: Zinc ore, 524,135,950 lb. valued at $11,334,687; lead ore, 73,111,850 lb., valued at $2,832,362; combined value, $14,167,049. Up to the first of this month it seemed certain that the total value for the district for the year 1906 would go beyond the fifteen million mark, but the great scarcity of cars makes it look a little doubtful just now; however, should the buyers be able to get the cars the record mark will surely be made.

The Thomas C. Mining Co., owners of a lease of 20 acres of the Four Hundred Prospecting Co.'s lease on the Schifferdecker land near Scotland, southeast of Duenweg, is now opening what promises to be one of the best mines in that part of the district. The company is driving at the 100-ft. level and has a face of zinc and lead ore 14 ft. high. The water supply is very short in that locality, and as soon as the company has more fully developed the size of the orebody, it is intended to commence drilling a deep hole for water in order to be able to clean the ore that is being taken out of the ground. At the depth of the present working, there is not enough water to keep one hand-jig supplied. An assay on the cuttings from the drill showed 20% zinc and lead, and the dirt now being hoisted shows about the same. The parties composing the Thomas C. Co. are all residents of Joplin and the mine was named after Thomas Connor, one of the owners.

A company composed of George C. Meece and Harry

Scherle of Joplin and several Kansas City parties has been formed to prospect on a 200-acre tract of land situated two miles north and one mile east of Carl Junction, owned by Jesse G. Starr, buyer for the Lanyon Zinc Co. in Joplin. The company has secured a drilling outfit and will let a contract for 1,000 ft.—Col. H. H. Gregg and others of Joplin, who have a lease on 40 acres of land in the northern part of Newton county, just south of Joplin, have succeeded in getting their shaft down to the ore and will soon begin making shipments. A number of drill-holes have been put down on the land and some good runs of ore were found.—The Good Day Mining Co. of Webb City has filed articles of association with a capital stock of $80,000, divided into 800 shares of the value of $100 each, all paid up for a term of 50 years.

The Alice of Old Vincennes Co., composed of Joplin, Vincennes, and Evansville (Ind.) parties operating on a 40-acre lease of the Schifferdecker land, west of Chitwood, has opened a rich run of ore at the 160-ft. level. A shaft is being sunk and is now down to a depth of 60 ft., and while the sinking is going on a modern 150-ton concentrating plant is being erected. It is expected the shaft will be in the orebody by the time the mill is completed and ready for operation.—The Moss mine at Alba, on the Rochester Land & Leasing Co.'s land, is being operated by several Webb City parties, who are highly pleased with the showing the mine has made since it began producing a short time ago. The weekly turn-in for the four weeks in November was: 74, 72, 87, and 78 tons, and the first week in December 107 tons, and this was done with only a single shift with a 150-ton mill. George Hardy of Webb City is manager of the company.

Bisbee Arizona.

The Strike in the Denn-Arizona. — Importance of the Discovery.— Details of the Occurrence.—Scarcity of Fuel.—Operations Crippled.—Shattuck-Arizona Meeting.—Another Smelter.—Development Work.

The feature of the week in the local mining field has been the strike of ore in the Denn-Arizona property, and it is looked upon as one of the great events in the history of the Warren mining district. The importance of finding ore in that part of the district where the Denn is located lies mainly in the fact that it is the first permanent orebody discovered in a portion of the camp where several million dollars have been expended without any encouraging results. Adjoining the Denn on the southeast is the American-Saginaw property, which is being operated by the Cole interests. To the south of the Denn is the Junction property, now included in the Superior & Pittsburgh holdings. The discovery of ore in the Denn at the place where it was found is really more important to the Junction than to any of the other surrounding properties, as the trend of the ore would indicate that it is an extension of a body that lies closer to the surface in the latter property. At the present time the Denn shaft has been sunk to a depth of 1,100 ft. At the 1,000-ft. level a station was cut, and a drift driven in the direction of the Saginaw-American property, the object being to connect both shafts as the Saginaw was also driving toward their side-line. When the drift had been pushed forward 600 ft. it was decided to run a cross-cut south and a little bit west to strike the diamond-drill bore. This cross-cut was driven 228 ft., when a round of shots opened up a full face of oxide and carbonate ore. Work was pushed forward vigorously, and at the present time 34 ft. have been passed through, and the face, floor, sides, and roof of the drift are still in the formation. The most competent experts in the district are of the opinion that a persistent orebody has been uncovered. Sinking of the shaft at this property is still going on, but no developments of importance have happened at that point.

During the past two weeks the fuel situation has become very embarrassing in the district, and on account of this condition the Calumet & Pittsburgh shaft of the Superior & Pittsburgh Co. was forced to close down, as well as the Hoatson shaft belonging to the same company. The fuel famine has also been felt by the Calumet & Arizona Co., but up to the present time they have not had to close down any shafts. Oil is used generally throughout the district as fuel, but in the present juncture most of the properties are being operated with coal. It was thought for a while that it would be necessary to close down the smelters, but a limited supply of oil has been secured, and fears on this account are practically allayed.



Map of Arizona.

At the Shattuck-Arizona the regular shipments of ore to the smelters are being materially increased, now that the new Allis-Chalmers hoist has been put in operation. A number of the Shattuck directors were here a week ago, and made arrangements for the regular annual meeting, which will be held here during the first week in January. The striking of the ore at the Denn, which property is controlled by practically the same crowd, removes all doubt of the construction of a smelter for these properties, and it is stated on competent authority, that arrangements for the erection of a smelter at once will be made by the directors at their annual meeting.——At the Cochise property the principal work being done is on the 300-ft. level in the drift, where a streak of ore was encountered some time ago. During the past week this streak has been followed for a distance of 12 ft., and the showing at the present time is most encouraging.——In the Huachuca district the Butte & Arizona and Princeton companies are pushing development work with all energy, but there have been no developments of an important nature.——Capt. D. A. Duncan, one of the owners of the Chiricahuaua property, in the Chiricahuaua mountains, has gone East for the purpose of consummating a deal for the development of the property, which has been declared to be valuable in spite of the slovenly manner in which it was handled.

Butte, Montana.

Strike in the Ophir.—Extracting Copper From Mine Water.—Important Development in Alliance Mine.— New Incorporations.— Copper Prospects in Beaverhead County.— A Local Mining Exchange.— Butte Exploration.— Rich Ore in the Eagle.— Prospecting the Trifle Claim.—Other News.

The strike made in the Ophir mine; owned by the Butte Central & Boston Copper corporation, has been demonstrated to be of an important character. The vein was first opened on the 300-ft. level, and has now been thoroughly opened at a depth of 500 ft.; it contains at that point seven feet of solid ore carrying 7% copper, and 300 oz. silver. The vein is separate from the original Ophir lode. There are now three known veins in this ground, one north and the other south of the one just cut on the 300 and 500-ft. levels. The north vein has an orebody 18 ft. wide; the south vein will be reached by a cross-cut being run from the 300 after going about 150 ft. farther. The foundation for the new 500-h.p. engine has been completed, and the superstructure is being made. The engine will be in position by Christmas.

The Butte & Superior Copper Co., owned principally by Duluth men, has begun sinking on the Black Rock shaft, and will take it to a depth of 1,200 ft. before any cross-cutting will be done. The shaft was 500 ft. deep, but the new company had to enlarge it and re-timber it from top to bottom with heavier material in order to make it fit for the deep work contemplated.——Frank H. Probert, the mining engineer who made an exhaustive study of the copper precipitating methods employed at the Rio Tinto mines several years ago, has just completed an examination of the plant of the East Butte Mining Co., and tests of the copper waters and tailing deposit on the company's ground. He says the East Butte plant is a crude affair, but it is one of the company's important earning features. He finds there is sufficient of the copper-bearing water to warrant the erection of a large and permanent plant, such as is in use at the Rio Tinto mines.—From tests that he made, Mr. Probert estimates that there are available 2,000,000 lb. copper, and that the supply is practically continuous. The water coming from a number of mines flows over the East Butte deposits, and leaves its copper to be added to the red metal that has been accumulating there for many years. A new and larger precipitating plant is being erected by lessees. The precipitating enterprise is a big source of revenue to the East Butte Co., as it gets a royalty of 25% without a dollar in outlay.

The Colusa-Leonard Extension Mining Co. has completed its new surface plant and sinking on the shaft has been resumed. The shaft was 75 ft. deep when work was stopped, in order that the new engine and boilers might be installed. The company owns a number of mining claims east of the Leonard and Colusa mines, of the Boston & Montana Co., that are considered to be in a good location. The development work is under the direction of William MacPherson. The company owns 47 acres of ground, comprising almost an exact square. —— The Butte-Montana Co., which has the Alex. Scott and Annie claims under bond, reports another strike of rich copper ore in a cross-cut south of the 600-ft. station of the Alex. Scott. The company is also trying to sell enough treasury stock to make a payment on the bond, which will soon be due. Operations have always been hampered by a lack of funds. The Alex. Scott is a fractional claim lying just north of the Dayton and Colusa mines of the Boston & Montana Company.

The Alliance Copper Co. has not yet determined the width of the orebody struck by it at a depth of 200 ft. a week ago, but the vein has been cut at another point, which proves it to be extensive; the ore has been cut into for 30 ft., and it is of high grade, a good portion being bonanza. The vein extends into the ground of the Farrell Copper Co., and undoubtedly will be found to extend through adjoining ground and the property of the East Butte Co., farther east.——The North Alice Mining Co. has been organized and incorporated with a capital stock of 1,000,000 shares at $1 each. Its incorporators and directors are Dennis Driscoll, Thomas McTague, John N. Bielenberg, M. O'Donnell, Richard K. Dwyer, E. Driscoll, and John E. Corette. The property of the company is north of the town of Walkerville.—Some Butte men are developing the Guy group of copper claims in the Elkhorn district of Beaverhead county. A shaft 150 ft. has been sunk, and at a depth of 30 ft. it passed through a 30-ft. vein from which some copper glance was taken. A cross-cut is being run from the bottom of the shaft. It is claimed that the formation of the district is similar to that of Butte. A number of other copper prospects in the Elkhorn and Argenta districts of Beaverhead county are being developed by Butte capital.

For the first time in its history Butte will soon have a mining exchange in operation. A company has been organized and incorporated with a capitalization of $20,000, and the following board of directors: E. L. Mayo, of the brokerage firm of Mayo, Sachs & Co.; R. A. Carnochan, of the United Copper Co.; J. H. Vivian, president of the Butte & Arizona Mining Co.; W. C. Lewis, president of the National Mining & Investment Co.; A. T. Morgan, capitalist; M. S. Largey, banker; C. F. Kelley, of the legal department of the Amalgamated Co.; H. B. Byrne, Butte manager for Paine, Webber & Co.; John N. Kirk, lawyer and mining man. The subscribers are all prominent bankers, mining, professional, or business men. —— The Butte-Potosi Mining Co. has been organized to work some silver claims near Potosi, in Madison county. The incorporators and directors are W. H. Young, and Joseph Farrell, of Pony; J. K. Heslet, Charles Schatzlein, and J. L. Templeman, of Butte. The company is capitalized for $1,000,000. —— The Cleveland-Montana Mining Co. is one of the new organizations that is engaged in intelligent development work in the Butte district. Its properties are situated far up the side of the main range of the Rocky mountains, about six miles southeast of Butte. An adit is in about 500 ft., and is approaching a point where the company expects to cut a vein. —— The drift being run north from the 1,000-ft. station of the Butte Exploration shaft on the Six O'Clock claim has been advanced over 100 ft. The ground is full of copper pyrite, and the indications are encouraging, although the expectation to find a small vein within 75 ft. of the shaft was not realized. The first big vein, which shows a surface outcropping, is expected to be found in the cross-cut between 200 and 300 ft. from the shaft. As there are no openings on the vein at all, its dip is unknown. It is believed to dip south and toward the shaft, though it may be found to dip north, as other veins in that vicinity are known to do.

Assays of the ore struck recently in the Eagle mine, north of Walkerville, gives 175 to 330 oz. silver, with an average of about 250 oz. per ton. —— The East Butte Extension Copper Co. has taken up the deeds to the ground on which No. 1 and 2 shafts are situated, paying cash. The price was $85,000. The ground adjoins that of the Alliance and Farrell companies. Regular shipments of ore are being made from two of the shafts of the Extension Co. —— The shaft being sunk by the Butte Copper Co. on the Trifle claim has reached a depth of 375 ft., and will be carried to the 1,000-ft. point as rap-

idly as possible. No development work has been done in the Trifle above the 300 level, but at that point some work was done on the vein, which was encountered 207 ft. from the shaft. The vein has been opened for a distance of 105 ft.; it is 44 ft. wide from wall to wall, and the orebody, which is continuous for the 105 ft. exposed, is 11 ft. wide. The ore is rich in silver and galena, and carries a good percentage of copper. Another vein carrying 10 ft. of 2% copper, and 15 oz. silver, has been cut in the Trifle shaft.

London.

Two New Issues.—The Russian Mining Corporation.—South Mount Boppy.—The Sudan Goldfield.—Indian Mining.—More Cornish Flotations.—Pseudomorphs of Tin After Feldspar.—Exacting Landlords.—Mexican Mines.—Ore-treatment at Stratton's Independence.

The week has been marked by two new mining issues of some importance, examples in their way of the diversity of aim and character of British enterprise. The Russian Mining Corporation, Ltd., has made its appearances under the auspices of the Venture Corporation, with the co-operation of the Consolidated Goldfields of South Africa and other powerful London financial groups. The share capital is £153,750, divided into 150,000 ordinary shares of £1 each and 75,000 deferred shares of 1s. each. The present issue consists of 75,000 ordinary shares and 75,000 deferred shares, which have all been privately subscribed. The ordinary shares in the original capital entitle the holders to be recouped by way of preferential dividend all capital (not being premium capital) from time to time paid up on such shares. After the rights of such shares shall have been satisfied, the divisible profits of the Company shall be distributed as to one-half by way of dividends on the share capital of the Company for the time being issued other than the deferred shares, and as to the other half by way of dividends on the deferred shares *pari passu*. The Company has already established an influential connection in Russia.

The other flotation in question is the South Mount Boppy Gold Mining Co., Ltd., an offspring of the Mount Boppy Co., both being under the management of John Taylor & Sons. The capital of the new company is £150,000 in £1 shares, the purchase consideration being £90,000 (to be satisfied wholly in fully paid shares) and the working capital is £60,000. In the leases acquired, which adjoin the Mount Bobby property to the south, a continuation of the Mount Bobby lode is expected to be found. It has already been traced to within 490 ft. of South Mount Boppy's northern boundary, and, according to its present trend, should be found on four of the latter company's leases for a total length of over 3,000 ft. Prospecting operations to the south of Mount Boppy Co.'s property have shown the lode to be persistent, varying in width up to 10 ft., and auriferous, and it is stated that the manager is confident of the best results being attained in depth. Through the leases lying to the southeast is a lode that appears to run parallel with the main Mount Boppy lode, and which has assayed from about 2 dwt. up to 32.67 dwt. per ton of quartz. Mr. William Frecheville took a sample from a trench that gave an assay of 8 dwt. 3 gr. per ton for a width of 1¾ ft. "An encouraging result," he remarks, "which should be followed up." The company will, therefore, have two lodes to develop, either or both of which may equal in importance the one now being so profitably worked by the Mount Bobby Co. It is proposed to sink a shaft to find the main lode in the South Mount Boppy Co.'s leases, and also to put down a shaft to the southeast upon the parallel lode. This work will be under the supervision of Mr. Thomas Pascoe, the superintendent of the Mount Boppy mine. The record of the parent—Mount Boppy—company is encouraging as an indication of the possibilities of its offspring. During the seven years of the company's existence 199,434 tons of ore have been crushed for a yield of 142,256 oz. gold, of the value of £436,237; thirteen dividends have been paid amounting in the aggregate to 161½%, or £183,632, the distribution for 1905 being the largest ever made, namely, 47½%; and on December 31 last the reserves of ore, although the mine is at present no more than about 400 ft. deep, were estimated at 182,000 tons—more than three years' mill-supply—containing a profit of about £230,000, or nearly double the amount of the nominal capital. The lode is of great width, exceeding 50 ft. in places, and rarely falling below four or five feet; consequently large masses of ore are opened out within a comparatively limited area.

In quite a different field of operation, but also under the efficient management of John Taylor & Sons, the Sudan Goldfield, which publishes its second annual report, is considered to present indications that point to a very good mine being ultimately opened up. On the Om Nabardi property several shafts have been sunk down to the water-level with fair results. The most encouraging development has taken place in the No. 2 air-shaft. At 210 ft. deep the vein is 4 ft. wide and assays 3 oz. per ton. At the 120-ft. level the vein was only 9 in. wide, going 15 dwt. per ton. The increase in width to 4 ft. and in value to £12 per ton is evidence that the lode is improving in depth. Development has been hampered recently by the lack of pumping apparatus, the management desiring to be sure of their ground before ordering expensive machinery. The vein has been traced along its outcrop for a length of 2,000 ft., while the 120-ft. level has been driven for the whole distance. The installation of the necessary machinery will allow the driving of a level at 240 ft., and when this is fully connected the ore disclosed may justify the erection of a battery. Conditions are favorable for working, water being plentiful and labor so abundant "that we have been able to pick our men."



Eastern Australia.

Another company under the same management, the Champion Reef, in the Mysore district of India, has issued

its eighteenth annual report to Sept. 30. It states that, including a net balance brought forward of £7,668 and £567 dividend from the Kolar Mines power station, a total sum of £349,844 is shown at credit of profit and loss. Two interim dividends of 9d. per share each, amounting together to £156,000, have been paid; £20,978 is retained for income tax; £10,134 is set apart for depreciation of machinery, plant, etc.; £5,000 has been distributed in accordance with the resolution of the shareholders, and £76,000 is appropriated toward the expenditure on shafts, buildings, etc. A disposable balance of £81,731 then remains, out of which the directors recommend a final dividend of 9d. per share, carrying forward £3,731. The total amount distributed out of the year's profit will then be £234,000 or 2s. 3d. per share, equal to 90% upon the nominal capital. A total of 203,174 tons of quartz were crushed, and 150,633 oz. bar gold were produced—an average yield of 14 dwt. 20 gr. per ton; and 207,143 tons of tailing and slime were treated by the cyanide process, resulting in the recovery of 27,008 oz. bar gold, equal to 2 dwt. 15 gr. per ton. The total return of 177,641 oz. realized £678,706. The stock of tailing from the old mill at the No. 2 cyanide works is nearly consumed; but there is a large accumulation of sand at the No. 1 mill available for treatment, in view of which the capacity of the No. 1 cyanide plant has been increased. Latterly, over 19,000 tons of tailing and slime per month have been dealt with, and as further additions are being made to the No. 1 plant it is anticipated that this tonnage will be maintained. Regarding developments: On the East Reef, which has been extensively developed in Garland's section, the results have been disappointing; for though the drivages and winzes over great lengths have showed strong, regular quartz from two to four feet wide, the value has been so low that the ore developed could not be included in the reserves of stoping ground. The reserves of ore are computed by Mr. Arthur Gifford at 383,071 tons, an increase of 4,155 tons upon the estimate of last year. He states that: "The main reef has been recently intersected at the deepest points at Garland's Carmichael's and Rowe's shafts, and though no great improvement is yet shown at these points, the continuity of the lode in depth has been proved, with about the same width and value as at corresponding points in the levels immediately above." At Carmichael's shaft the drivages on the lode at the lowest level—the 2,940 ft.—show a width of 2 ft. 3 in. and a value of 19 dwt. 8 gr. of gold per ton, while at Rowe's the deepest level there has disclosed some rich quartz near the northern boundary, demonstrating that shoots of higher quality hold down to the deepest points worked. For these reasons the directors feel that they have strong reasons for looking forward to the opening up again of ore of better quality.

The Western Tin & Copper Syndicate has been registered with a nominal capital of £50,000 in £1 shares "to acquire and turn to account any tin, copper, coal, iron, or other mines, rights, and metalliferous lands in Cornwall or elsewhere." The first operation of the Company will be to unwater an important group of mines recently acquired after somewhat prolonged negotiations. There is to be no initial public issue of shares, the group which has subscribed the necessary capital deeming it best to first unwater the property, and, so far as possible, demonstrate its value before asking the public to take any financial interest in the concern. Information is forthcoming from St. Agnes of the registration of a company to work Wheal Coates, a tin and copper proposition, worked on a small scale over a century ago. The last company ceased operations in 1884, when the tin standard was £71. The last sale at the ticketing was in November of that year, a small parcel of black tin fetching £42 per ton. The average produce for many years was about 20 lb. tin per ton of stuff. The main lode is nearly vertical—slightly underlying south and outcrops in the cliff. The underground operations extend a good way under the sea. Both engine-houses and the stamps were on the cliff. Wheal Coates has gained some notoriety by the fact that in this mine were found pseudomorphs of tin after orthoclase. They were found in the form of crystals, the same shape as the crystals of feldspar that are seen in granite. It is believed that this is the only case in the world in which tin has been found in this form. Wheal Coates suspended operations because of the low price obtaining for tin; while a small pit-work was overpowered by an abnormal quantity of water let out by a newly cut lode. Some excitement among local miners and others (writes a *Western Morning News* correspondent) has been caused by the recent discovery of a rich tin lode on the South Wheal Leisure mining property, owned by Mr. Stuart Bailey, of Perranporth. At 20 ft. from the surface a tin lode was found, some stones from which were crushed and vanned by Mr. F. Penna, who judged it to go about 1 to 1½ cwt. black tin per ton of lode-stuff; value £5 to £7. This rich find is not surprising, as the locality was well known to the 'old men,' judging from the innumerable 'pits' and 'burrows' along the backs of the lodes, where these ancients worked for tin. Although the labor question is not yet serious in the Redruth and Camborne districts, it may become so sooner than some think, and mine directors may do worse than give some attention to the matter. The *Mining World* considers that it will be interesting to note to what extent the ground landlords will come forward, more particularly in granting plots of land to miners upon which to build cottages of their own. There are many instances in the mining districts of men who helped their fathers to build cottages on the life system, who have been exasperated at seeing these cottages go back to the ground landlord, from whom they must buy back should they desire to live in them. It is therefore little wonder that the miner leaves the place of his birth, and the landlords will be wise to consider this matter, for the longer it is delayed the more exacting the terms will ultimately be.

A special cable dispatch from the City of Mexico to the *Financial News*, says: "The San Francisco del Oro has struck a remarkably rich vein, promising great results, and has also struck a permanent water supply, thus rendering easy the erection of its own mill and proving of untold benefit to the Company. The entire district is interested, with the result that a keen demand for the shares has commenced." This news will help the growing interest in the shares of the Company. A year ago they might have been bought for one shilling, today they are a good market at about 21s. Apropos of Mexican mines, the story is told of the jobber who having taken a literary lady into dinner recognized, for a time, that the conversation was a little out of his depth, and was accordingly glad when a subject was at last introduced on which he felt qualified to pass an opinion. "What do you think of the future of Esperanto, Mr. Smith?" she asked. "Risky, of course; like all those American mines," he promptly replied; "but if the rich shoot holds out I'd sooner be a bull than a bear at present prices."

Some little time back it was mentioned in my correspondence that the dump and low-grade ore treatment at Stratton's Independence was about to enter upon a new phase. It was then thought that Mr George A. Schroter was on the point of putting the completing touch to the problem. Further unexpected delays, however, occurred. It is now stated on good authority that Mr. Schroter's engagement as consulting engineer having terminated by effluxion of time, Mr. Philip Argall has been appointed in his place. It is said the directors were influenced in tak-

ing this step by the desirability felt of their being in direct touch with a metallurgist of undoubted standing, having his headquarters at Denver, possessing also the necessary local expert knowledge of the special conditions of mining and milling at Cripple Creek.

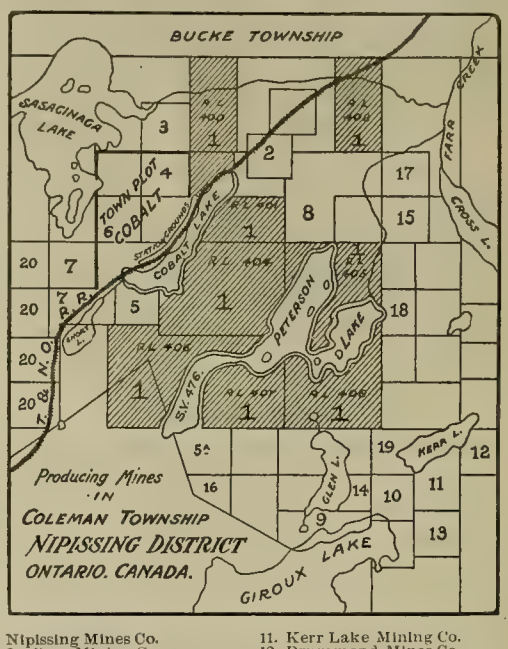
Toronto, Canada.

Nipissing and Its Title.—Conflicting Opinions.—Regulation of Joint-Stock Companies.—A Custom Smelter.—Mining Operations at the Cobalt Mines.—Wonderful Ore.—Chunks of Silver and Niccolite.—Supposed Gold Find.

The latest phase of the situation as regards Nipissing and the alleged flaw in the title, which was the cause assigned for the withdrawal of the Guggenheim interest, is the issue of a writ by John McKay, a Cobalt contractor, claiming 40 acres, part of which is now held by the Nipissing company, on the ground of priority of discovery and fraud on the part of the locators. The writ names as defendants the Nipissing Mining Co., Ltd., E. P. Earle, James B. O'Brien, Michael J. O'Brien, Thomas Herbert, Arthur Ferland, Severin Ferland, and Wm. C. Chambers. The area claimed includes 20 acres of the north end of the Nipissing property. The Nipissing interests and other mine owners affect to regard this action as the result of Guggenheim manipulation to bear out their course in throwing up their option, and speak of the supposed flaw in title as a rumor originating in New York. Now, whatever may be the case as to the motives inspiring the law proceedings, one fact is abundantly clear, namely, that the rumors as to the vulnerability of the Nipissing and other titles did not originate in New York. They date back to the early days of the camp. After claims had been located wholesale by 'snow-shoe prospectors,' it was again and again announced that many of them were likely to be disallowed on the ground of fraud, and the Nipissing was specified as being one, the title to which would be attacked. As a matter of fact, these anticipations were not realized. There was no general onslaught on shaky titles, and, possession being nine-tenths of the law, there is not likely to be any at this stage. Still it is easy to be seen how the revival of the question of title is at any time likely to have a disturbing effect on the market, and, until the law is changed so as to confirm the titles and remove all doubts, it must be reckoned with as a possible factor in stock manipulations.

The Provincial Government has drafted a bill to be submitted to the Legislature, making drastic changes in the law respecting joint-stock companies. It requires very full returns to be made at annual meetings, provides for the issue of share warrants by the delivery of which shares may be transferred, and renders directors liable for all statements in prospectuses, including those based on expert testimony. A fixed minimum share subscription is insisted upon prior to the allotment of share capital, in order to prevent flotations on inadequate capital.——The North American Cobalt Refining Co. has decided to erect a large smelter for the treatment of Cobalt ores. The company, the principal shareholders of which are mine owners, has been carrying on experiments for six months at a smelter erected at Hamilton, at a cost of $35,000, and claims that they are able completely to separate the arsenic, cobalt, and other by-products from the silver. The plant to be erected will cost approximately $200,000 and have a capacity of 500 tons per day. It has not yet been decided whether it will be placed at Hamilton or some other point.

At the Nipissing mine there are 200 men at work, operations being continued day and night. On veins 10, 19, 25, and 49, shaft-houses have been built and the shafts will be put down 500 ft. At No. 10 a cross-cut will be run at the 100-ft. level to No. 26, which is about 50 ft. distant. The shafts at No. 10 and 27 are now down about 40 ft. and that at No. 19 has reached a depth of 70 ft. Vein No. 26 is being worked at the 55-ft. level, where 180 ft. of driving has been done. This vein is wholly in the Keewatin formation and has so far yielded ore worth $300,000. No ore is now being taken from vein No. 19, known as the Bonanza vein, as a lower depth is to be reached before driving. Forty-five barrels of rich ore are awaiting shipment.——Preparations are being made for the installation of a stamp-mill at the McKinley-Darragh-Savage mine. A nugget of niccolite and silver was recently unearthed in the course of open-cut operations, that weighed 700 lb. and ran 2,000 oz. silver per ton. It was found on vein No. 1, which runs into the corner of Cobalt lake, owned by the company. The shaft on this vein is



1. Nipissing Mines Co.
2. La Rose Mining Co.
3. Tretheway Silver-Cobalt Co.
4. Coniagas Mining Co.
5 & 5 A. McKinley-Darragh-Savage.
6. Buffalo Mines.
7. Cobalt Silver Queen.
8. O'Brien Mining Co.
9. University Mines.
10. Lawson Cobalt-Silver Co.
11. Kerr Lake Mining Co.
12. Drummond Mines Co.
13. White Silver Co.
14. Foster-Cobalt Mining Co.
15. McLeod & Glendenning.
16. Silver Bar Mining Co.
17. Violet.
18. Star Silver-Cobalt Co.
19. Silver Leaf Mining Co.
20. Temiskaming & Hudson's Bay Co.

down 175 ft., and driving has been done at the 75-ft. level, and the vein exposed for 100 ft., presenting a width of 8-in. niccolite and silver, showing 2,500 oz. silver per ton. At the 150-ft. level there will be a cross-cut run to shaft No. 2, which is now down 83 ft. The latter shaft is sunk on the vein, which averages seven inches, and is rich in argentite and wire silver. This vein also runs into the lake. No. 3 shaft has been sunk 55 ft. and driving has been begun on the 59-ft. level. The vein is silver and niccolite, carrying about 1,200 oz. per ton in silver. The company has purchased from Allis-Chalmers-Bullock, Ltd., Montreal, a quantity of machinery including a cross-compound air and compound steam Ingersoll air-compressor, Ingersoll rock drills, two 80-h. p. boilers, a Lidgerwood standard hoisting engine, etc.

At the Red Rock, Joseph Harrass, the superintendent, an experienced Cornish miner, states that 17 veins have so far been traced and 3,000 ft. of stripping done, test shafts being sunk on all the veins. At No. 1 vein the shaft is down 40 ft. and some driving done. The surface width, varying from 4 to 12 in., was found to be well maintained as well as the quality of the ore. The vein

known as No. 1 Extension, which has been stripped for 300 ft., is much richer. It is two feet wide and heavily charged with native silver. A 40-ft. shaft has been sunk on it.——Extensive development work is going on at the Foster mine. Alexander W. Scott, late manager, has left the service of the company, which is looking for a man to take charge. Four shafts have been put down and stoping between two of them has been done to the extent of 110 ft. The installation of the extensive new plant is being rapidly proceeded with, and it is expected to be in operation by the new year.——A 400-lb. nugget was found on vein No. 1 of the Green-Meehan mine on the 8th inst., and another of 200-lb. weight this week.——The shaft of the Nancy Helen is down 80 ft. and a rich vein is being worked, a quantity of ore being ready for shipment.——A strike of gold in the Kinler shaft of the Temiskaming & Hudson Bay property was reported a few days ago. It is stated that assays showed $151 per ton in gold and $5 in silver in a vein six feet thick. The report has not been confirmed and experts are not disposed to attach much importance to it.

Prof. W. G. Miller, provincial geologist, received a telegram yesterday from E. T. Corkill, mining inspector in charge of the Government work on the Gillies timber limit, Cobalt camp, stating that in drifting on the 70-ft. level a large body of high-grade silver-cobalt ore had been uncovered. On the other vein which is being developed, a depth of 25 ft. has been reached and, though the ore is not so wide as on the first vein, it has been determined to let a contract for a shaft of considerable depth. Prof. Miller left yesterday for the mine to investigate and report on the discovery.

Cobalt, Ontario.

Discoveries in the Red Rock.—Story of Varying Fortune.—A Railroad Track Rich in Ore.—The Right of Way Co.—Nipissing and the Guggenheims.—Gossip of the Camp.

One of the richest of the recent finds has been made at the Red Rock where a vein has been exposed for 300 ft. with a width at the surface of two feet and disclosing a streak of solid argentite and native silver two inches wide. A 40-ft. shaft has been sunk on it at one end near the Green-Meehan line and the richness and width have been steadily maintained. This vein has been called Extension No. 1. It runs parallel to the vein called No. 1 and, therefore, it is not obvious why they call it an extension. The Red Rock consists of 40 acres, being the northwest quarter of the south half of Lot 14 in the First Concession of Bucke, and adjoins the Green-Meehan. Coleman and Bucke townships adjoin. The Red Rock was formerly owned by McMartin, Timmins, and Dunlop who are well known as the owners of the celebrated LaRose mine. They formed a company with a capitalization of $1,000,000 and put about 150,000 shares on the market at a par value of one dollar. A good vein was known to have been located and the stock was largely subscribed. Then a shaft was started and it is said that in sinking it they lost the vein or it petered out. Despite the large holdings of the public, the promoters got disheartened and for months work was practically abandoned. Some outsiders with faith in the property had it carefully but quietly examined, and as a result they secured an option on the remaining 792,000 odd shares at a price of less than 25 cents per share. In the meantime an enormously rich vein had been found on the Green-Meehan, which consists of the 40 acres directly to the north, and the vendors sought to evade the sale, but the deal was closed. R. R. Gamey, F. B. Chapin, president of the McKinley-Darragh-Savage mines, and Geo. E. Bristol were among the purchasers, and they sold within a few days to a New York and Pittsburg syndicate, of which Quincy Ward Boese is the controlling spirit. The purchase price has not been made public, but within a few days of the second sale the rich find was made that has been described. The vein had been known for some months, but it had not been sufficiently stripped until recently to show the rich outcrop.

The big Green-Meehan vein extends into the Red Rock, but just at the dividing line between the properties it divides into two branches of two feet each. One of them has been stripped for 200 ft., and carries six inches of very rich ore. It is well defined and promising; a shaft has been sunk on it and, by cross-cutting, the other branch (known as No. 16) and a third vein, called No. 15, will be worked. Vein No. 15 was one of the veins first found. It consists of calcite with cobalt and some silver. At the Red Rock one car of high-grade ore and two cars of low-grade stuff are ready for shipment. Seventeen veins have been identified, and as only half the property has been prospected, the present outlook in that part of the township is most promising. Joseph Harrass is the superintendent; he is a well-known Cornish miner who has worked in Ontario in the Sudbury and Kingston districts; E. C. Kingswell, of Haileybury, is consulting engineer.

A railroad that has its own mines and that takes out ore running 6,000 oz. silver by the side of the track appears to belong to the pages of romance, but such is actually the case at Cobalt, where the company known as the Right-of-Way Mining Co. is working three miles of the track allowance. Cobalt lake lies in about the middle and the track runs along it for about a mile, so that while the company has from mile-post 101 to 105 it has only about 1½ acres lying between the O'Brien mine and the lake. At a point on the track opposite the boarding house of the La Rose mine they struck the rich Timmins vein and it is thought by mining men in the camp that this vein extends right down to the lake. The vein has been uncovered for about 40 ft. and has a width of eight inches of silver and niccolite, which runs as high as any ore in the district.

The government railway has given the Right-of-Way Mining Co. a 999 year lease of these three miles in return for $50,000 in cash and a flat royalty on all ore mined. The company is capitalized at $500,000; the shares have a par value of one dollar and have sold as high as $12. T. Beament, an Ottawa lawyer, is the president; G. O. McMurtry, is the superintendent, he is a Canadian, well known at Rossland and Nelson, B. C.

The action of the Gugenheims in refusing to carry out their agreement for the purchase of a block of Nipissing stock is looked upon here as an effort on their part to cause a slump by taking advantage of which they could secure the same amount of stock at a much lower rate than they were agreeing to pay. Their option called for $25 per share. The Canadian holders of the stock were not frightened and kept a tight grip on their holdings. The attempt to cast discredit on Cobalt titles has caused indignation in this country and the Government of the Province through its Premier, has declared that the title to the Nipissing property was not questioned. It is known that the Guggenheim agents have been in camp for months and that they have secured options on a great many properties. It has also been stated that these same people contemplated the erection of a smelter. The outcome will undoubtedly be the erection of a Government smelter for the treatment of the copper, silver, and nickel ores of the region now known as New Ontario.

Mining Summary.

ALASKA.

The official records at Dawson show that the Klondike gold output for this year was slightly over $5,600,000. This includes all the gold-bearing territory within 50 miles of Dawson, and the year's collection of royalties is based on these figures. Ten full mining seasons have passed since the discovery of the Klondike, the total output to date from this district amounting to $112,000,000. Large dredges are now working on Bonanza and other creeks, with many more to be installed next season.

ARIZONA.

COCHISE COUNTY.

The 1,000-ft. level which the Tombstone Consolidated Co. has been striving to reach for the past four years has been gained, after the expenditure of several million dollars and the handling of an average of 4,000,000 gal. of water every 24 hours during that period. A large station will be cut out at this level and a sump 35 ft. deep will be sunk to handle the water. A set of mammoth pumps will be erected at the station similar to those now in use at the 600 and 700-ft. levels. The underground workings will be pushed into the old Grand Central and Contention properties to tap the orebodies known to exist below water-level.——Work is progressing rapidly at the Silver Thread, the 600-ft. level having been gained. The winze had reached a depth of 135 ft. from the 500-ft. level when copper was struck, and water prevented further working at the time. At the mill, 40 stamps are kept at work continuously, and last week a shipment of concentrate valued at $25,000 was made; a regular clean-up of bullion takes place every two weeks.

An entirely new body of high-grade sulphide ore has been found in the P & D ground, Quadrangle district, near Bisbee. The strike was made in a drift that is being run from the 1,100-ft. level of the Lake Superior & Pittsburgh shafts. Samples have been taken along the exposed vein for assay. Lack of fuel has crippled the pumping at the Briggs shaft belonging to this company, and sinking has been stopped until the fuel famine is mitigated.——A strike has also been made at the Junction mine at the 1,000-ft. level, in a drift running westerly toward the Gardner and Sacramento ground of the Copper Queen Co. Returns from assays are said to be very high, but exact figures have not so far been made public.

PINAL COUNTY.

(Special Correspondence).—The Big Lead Milling & Smelting Co.'s concentrating plant at Kelvin, with a capacity of 50 tons per day, is finished and ready for work, and the wheels of the new machinery are to begin grinding out high-grade concentrate that runs from 35 to 40% copper in a few days. W. E. Sharps, of Philadelphia, president of the Big Lead Mining & Smelting Co., Calumet Copper Mining Co., and Kelvin Reduction Co., whose properties are located six miles north of Kelvin, on Mineral creek, is on the ground making an inspection of the prosperous property of which he is the official head. Under the able supervision of Mr. Tuitchell, superintendent of both the Big Lead and Calumet companies, and of R. G. Mead, superintendent of the Kelvin Reduction Co., all obstacles have been met and the flattering predictions made two years ago regarding these properties have been fulfilled. Mr. Sharps has been greatly assisted in this great undertaking by Mr. Tuitchell, for under his supervision at the mines the ore is mined in an up-to-date fashion. Not a dollar is expended unless absolutely necessary; no debts are incurred unless ample funds are on hand to meet them; the company has never missed a pay-day; its credit is the best and its standing excellent. The Calumet Copper Mining Co. is shipping large quantities of copper ore to the Humboldt smelter and the management is well satisfied with the output of the mine. In connection with the Calumet it is said that since Mr. Sharps arrived, he has had two flattering cash offers for the property and he has unhesitatingly refused them. Owing to the large number of claims in the district carrying sulphide ore, it is intended to increase the capacity of the Kelvin Reduction Co.'s plant, and in addition to the leaching of the copper, which is now progressing favorably, concentrating machinery will be added and the ore from the mines of its own and also custom ore from various claims adjacent thereto will be worked, much to the advantage of both the producer and operator.

Phœnix, Dec. 15.

CALIFORNIA.

INYO COUNTY.

A syndicate of capitalists with Dr. W. J. Nelson of Los Angeles at their head, is about to begin the development of the S. P. Roberts group of mines recently acquired in the Pine Mountain district. Heavy snow-storms will prevent much work being done till the spring, when the present adits will be continued so as to test the lodes that outcrop above. Fourteen mines are included in the deal; they are situated on Index hill and are the heaviest lead-bearing deposits in the district, carrying also some gold and silver. The mineralized belt, half a mile wide, is known to extend at least four miles north and south. The country rock is a brown slate, containing lime. The ore at 200 ft. runs from $10 to $12 in gold, while kidneys of high-grade galena were frequently encountered in the older workings. Water and wood are plentiful in the vicinity.——The Black Canyon Co. has driven two tunnels each 90 ft. long into the orebody exposed in Black cañon, 10 miles from Bishop. The ore encountered in both cases is of an average value of $20 per ton.

MONO COUNTY.

A number of companies were organized last week to develop mines in the Masonic district. A million-dollar corporation, the Masonic Investment Co., organized at Carson, Nev., has obtained control of a number of claims, including the Oro Grande, Golden Mammoth, South Side, and Emporium. The Caliveda M. & M. Co., another Nevada corporation, has taken over the Wednesday and Wednesday Fraction, and has also purchased the Golden Reef and Golden Crown from Van Sickle, Smith, and Simmons. The Masonic M. Co. is doing extensive work on the True Friend group, and is reported to have uncovered a fine orebody.

NEVADA COUNTY.

The Boss mine, between Sweetland and North San Juan, a low-grade proposition with an immense orebody, is to be worked on an extensive scale by C. L. Crane, E. H. Benjamin, John Collier, and associates. A crew of men will be put to work at once, a hoisting plant erected, and the big lode given a thorough test. In the spring a mill and cyanide plant will be built.

The California mine on Deadman's Flat, which was shut down about 12 years ago owing to litigation, is being unwatered preparatory to the resumption of work upon an extensive scale. Electric power is now available, and the pumps will be kept running day and night. The hoist has been found to be in good condition, and, with the unwatering of the shaft, active mining will begin. The mine paid handsomely in the past, and it is known that an extensive vein of good quartz lies at the bottom of the shaft.

SHASTA COUNTY.

After years of litigation the Harrison Gulch townsite case has been decided by the Commissioner-General of the Land Office, who rejects the application of the townsite company for a patent. The owners of the Bonanza claim, who contested the application, have won the case. The decision involves the entire town of Harrison Gulch, which is thickly settled.

TUOLUMNE COUNTY.

Electric power and water is again obtainable, and as a consequence the usual activity in mining is being resumed. —— Conlin Bros. have purchased a 40-h.p. compressor for the Experimental mine, near Columbia, and intend to begin at once driving a 1,000-ft. adit at that property.—— Operations have been temporarily suspended at the Lone Star mine, situated a few miles north of Confidence, owing to the severity of the weather. Ten men have been employed at this property.—— The Omega and Crystalline mines will resume operations about January 1, provided fuel-oil arrives by that time. W. C Ayers, the superintendent, has gone to Tonopah for a few weeks. It is reported that he will assume charge of properties there also.—— It is expected

that the work of unwatering the Mazeppa mine will be completed within 30 days, when active underground work will be commenced. The shaft is 900 ft. deep, and there are several drifts above the 500-ft. level. It is the intention to start two new drifts, one at the 700 and another at the 800 level.—— Some high-grade ore has been uncovered at the 150-ft. level of the Imperial mine, situated near Jacksonville. The property is under the superintendency of Chas. Fitzgerald, who is pushing development work along as fast as possible. Driving is in progress on the level mentioned, and soon sinking will be resumed. The rich shoot of ore recently uncovered is from 10 to 30 ft. wide.

Tuolumne, Dec. 18.

YUBA COUNTY.

The majority of the stock of the Marysville Gold Dredging Co., comprising the interests of Eugene De Sabla, John Martin, W. P. Hammond and others, has been sold to the New England Exploration Co., of Boston, of which R. E. Cranston, of Sacramento, is Pacific Coast manager. The consideration is said to be $8,000. The company owns 1,300 acres of mining ground adjoining the Yuba Consolidated goldfields on the Yuba river ten miles east of Marysville, and has two large dredges operating and others building.

COLORADO.

CLEAR CREEK COUNTY.

A vein a foot wide of smelting ore assaying from 150 to 300 oz. silver per ton has been uncovered at the Little Emma mine, on Democrat Mtn. The discovery was made in running a cross-cut from the old workings, the ore being similar in character to that mined a number of years ago when the property was being developed by P. J. McNulty, and a production in excess of $350,000 extracted. The present owner, Patrick Walsh, is now opening up the new ground preparatory to stoping, and the first shipment of high-grade ore is to be made in a few days.—— The Mammoth property, located on the opposite side of the gulch from the Terrible and other famous mines above Silver Plume, has been secured under option by Daniel Williams, representing Denver capital. Work will be started forthwith. In the Mammoth there are large bodies of lead and zinc ore that could be handled at a good profit with proper milling facilities. The new operators will construct an aerial tramway connecting the dumps of the mine with the wagon-road, from whence the product can be handled in an economical manner. A milling plant near Lawson has been secured, and the low-grade ores will be shipped there for concentration. This mine was idle for a number of years until about 18 months ago, when it passed under bond and lease to Dennis Gibbons, of Denver.—— A party of Denver and Eastern capitalists has purchased the lease held by William Jewell upon the dumps of the upper Mendota workings. A concentrating mill will shortly be constructed near the old Brownville schoolhouse, and the preliminary work is already well in hand.—— An important strike has been made at the old Lucky Hesperus, at one time the richest mine of the Democrat Mtn. district. A solid body of smelting ore was uncovered last week, the vein measuring over 12 in. thick, and assaying 300 oz. per ton silver. The ore-shoot, which was lost a number of years ago, is believed to have been found by Chas. Carlson, who holds a lease upon the property, and as soon as the ground has been opened up for the required distance stoping will be carried forward. The discovery was made while running a cross-cut under the old workings, and a large area of virgin ground has now been opened up for further exploration.

The Main Gulch Co. has declared a dividend, after less than eight months of operating. Since taking hold of the property the management has sunk the shaft to a depth of over 100 ft., and about 1,100 ft. of driving along the vein has been accomplished. On the third level the top of what is known to be a large orebody has been passed through for a length of over 150 ft. The shaft is being put down in order to intersect this orebody at greater depth.

TELLER COUNTY.

The Union Leasing Co. has taken up the lease on the tenth level of the C. O. D. mine, near Cripple Creek, formerly operated by Hayden & Gallagher, and recently forfeited by them. The Leasing Company will explore at depth for the Gold Coin vein, which is known to enter the C. O. D. property. On the fourth level of this mine, Tillery & Co. will resume cross-cutting shortly.—— The Beacon Hill Development Co., operating on the 600-ft. level of the Gold Dollar mine on Beacon hill, last week shipped four cars of ore, two of which are expected to give from five to seven ounces in gold per ton.

IDAHO.

SHOSHONE COUNTY.

The International Mines, Ltd., developing 11 full and four fractions near Burke, will award contracts for 400 ft. of additional adit, which is expected to cut the vein in a few days. This will bring the face of the adit in 450 ft., with a vertical depth of 175 ft. Announcement was made that the Federal Mining & Smelting Co. has acquired the property.——Half a carload of ore has been shipped from the Pilot mine near Murray, for treatment at Denver, Colo. The Pilot is the property on which the sensational gold strike was made last summer. The group had been bonded to the Day brothers for $200,000 and a payment of $20,000 made. The Day brothers did a considerable amount of development on the property but did not have sufficient time to satisfy themselves with regard to the extent of the strike. When the second payment became due, they applied to the owners, Frank Frohling, John Docktor, and L. Prager for an extension of time. This was refused and the property reverted to the original owners, who are working it.——The vein on the Mineral Farm group, near Mullan, is, from surface indications, 100 to 300 ft. wide. The lower adit has been in talc for nearly 400 ft., but recently at a point 700 ft. from the portal, the vein matter became sufficiently solid to hold without timbering.——William A. Nichols of Spokane and Kratzer & McKinnis of Wallace, have secured the control of the National Mining Co., owning a group of six claims on Snowstorm mountain, near Mullan. The claims are just west of the Lucky Calumet and join the Independent and the Copper King on the south. The company is capitalized for $1,250,000.

Six feet of copper ore is the strike on the 250-ft level of the Reindeer mine near Mullan. It is the intention of the company to sink 100 ft. on the orebody. Enough ore is blocked out to make five or six shipments.

NEVADA.

LINCOLN COUNTY.

(Special Correspondence).—Among the later companies to develop properties in the Searchlight district, the New York-Searchlight may be mentioned. Financed by a syndicate of New York capitalists, the management are installing the first diamond drill for use in the district. The property owned by this company consists of the Waterspout, Orlando, Eclipse, Daylight, and Starlight lode mining claims, situate north of the Duplex and Quartette mines and due east of the Santa Fe. The shaft on the Waterspout claim was sunk for the purpose of striking water for domestic purposes. Water was encountered at a depth of 145 ft., but was unfit for such use owing to the copper taint. Prospecting at this depth revealed the existence of three well-defined veins carrying gold and copper values. The shaft is now down 240 ft. all in ore. Values on this property run from $3.20 to $86 in gold with a small percentage of copper.——Crescent lies on the western slope of the Crescent hills, which divides the Searchlight valley from the Ivanpaugh valley. The Crescent district is one of the oldest mining sections in the State of Nevada. Mexicans worked the Zatche mine, now known as the Old Mexican, and the gold and silver production from 1863 to 1878 amounted to over $500,000, which was transplanted on burros to Good Springs, where it was arastred and melted into bullion bars. In July, 1878, a band of Mormons raided the burro wagon, killing most of the leaders, after which the mining in this district was suspended until the spring of 1904, when a party of Eastern mining men re-located the mine, and within six months 300 claims had been recorded in the Crescent district. At the present time there are 23

companies actively operating and upward of 25 owners developing. The district has all the characteristics of the Searchlight camp, especially the immense veins that trend north and south. Within one year over two millions of dollars worth of ore was blocked out on two properties and surface showings approach those figures. The following are among the developing mines: The Nippeno, which is down 325 ft., having immense bodies of high-grade ore in sight; the Lucky Dutchman with a depth attained of 350 ft., showing a heavy ore reserve. The Tiger mine is sinking a vertical shaft on the vein that traverses the entire length of three claims, a cross-cut showing 178 ft. of ore averaging better than $8 in gold. This is one of the big bonanzas of the district.

The Barnwell & Searchlight railway is building a standard guage road from Manvel on the Santa Fe system to Searchlight, a distance of 26 miles. The road is expected to be in operation about January 1, 1907. The graders have the road to within three miles of Searchlight, and the track is completed for a distance of fourteen miles. The arrival of the railroad will be the cause of much rejoicing among the mine owners of El Dorado cañon, where many thousands of tons of base ores that are now blocked out can be transported to the smelters at Needles and made to pay a good profit. Heretofore, owing to the excessive freight charges, these properties shipped only the high-grade output.——The Salt Lake route has a station at Nipton, 25 miles west of Searchlight and passengers are carried in six-horse Concord stages operated by the Nevada Transportation Co. The road is kept in good condition all the year round, and good time is made.

Searchlight, Dec. 10.

WHITE PINE COUNTY.

The Copper Basin Syndicate has purchased a group of rich copper claims on Bald Mtn., in the Ely district. The property carries gold, silver, and copper, and the consideration is said to be $300,000, a cash payment having been made of $30,000. There is a large body of ore now in sight, which has been sampled and found to give an average assay of 5% copper, $10 in gold, and $10 in silver. The syndicate now has a force of thirty men at work, which will be increased in the spring, when a large furnace will be erected.

NEW MEXICO.

SOCORRO COUNTY.

The Graphic mine in the Magdalena district is now employing 60 men and the force is to be increased in the near future. This claim, one of the abandoned mines of New Mexico, was bought by an Eastern company for the zinc, and has paid for itself a couple of times since it was purchased by the present corporation. A large amount of development work has been done, and the great vein of copper formerly worked has been uncovered at a greater depth in the new adit.——Another of the worked-out mines picked up by Eastern capital is the Kelly claim, now owned by the Tri-Bullion company, which has already paid back the purchasers the price of the property. A contract has been recently closed for an equipment of hoists, compressor pumps, and electrical machines. The hoisting plant will handle 500 tons per day from a depth of 1,000 ft., the compressor operating 15 Ingersoll drills. A complete reduction plant is to be installed, consisting of a 300-ton zinc plant and a 350-ton concentrating plant with two furnaces, for silver-lead and copper ores respectively.

SANTA FE COUNTY.

The San Pedro copper mine, situated 21 miles south of Santa Fe, now owned by the Santa Fe Gold & Copper Co., of New York, is to start work again, giving employment to a large number of miners. The company is virtually a reorganization of the old San Pedro Copper Co., that became bankrupt 15 years ago. The property includes the San Pedro and Cañon el Agua grant, comprising 50,000 acres of land, a large proportion of which is mineral, including good coal-lands. The copper vein being worked is a blanket vein of sulphide ore 175 ft. thick, dipping at an angle of 15°. The ore is low-grade, that mined and smelted years ago giving 4.75% copper, $1.50 silver, and $1.50 gold per ton. A reserve of 30,000 tons of ore has been blocked out, and the workings are in good shape in spite of the long period of idleness. The ore is silicious, requiring heavy lime and iron fluxes.

OREGON.

BAKER COUNTY.

(Special Correspondence).—About eight years ago a small organization of eight traveling men started what is now the Commercial Mining Co., of Portland. Their purpose was to develop a prospect on Burnt river, about 30 miles southeast of this city. Work to that end has been going on constantly, and this year the prospect developed into a mine from which the output is now $1,000 per day in free gold. Fourteen triple-discharge stamps are in use.——The Colts mine, situated a short distance from the property of the Commercial Co., is also on the producing list, with a 10-stamp mill that is kept busy; 35 men are employed.——The Tetro and Kidd property, recently purchased by J. W. Messner from Regan & McCord, is in the same district and is operating a 5-stamp mill with good results.——The Gold Coin is distinguished for the exceptional width of its orebody. The vein is a conglomerate about 60 ft. wide, that is said to average $9 per ton in free gold. A 10-stamp mill was erected, but on the eve of starting, it was destroyed by fire. The plant is to be rebuilt and 10 more stamps will be added.——Col. James Panting, owner and manager of the Gold Hill mine, is making some improvements with a view to active production.——Burnt river has long been noted for its placer gold and some of the earliest diggings in eastern Oregon were worked in this district. Only the rich ground in the channel, however, attracted the early miners. Recently J. F. Batchelor bonded a number of ranches lying along Burnt river, among them the Thompson & Swasey ranch, the Ellis ranch, the Shook ranch, and the Sissley ranch. His purpose is to put dredges on these farms as soon as spring opens.——On the Powder river side of Lookout Mtn., about 12 miles from the Conner Creek mine, the most notable property is that of Timber Canyon. About 1,000 ft. of work has been done underground and an ore-shoot 150 ft. long has been developed at a depth of 120 ft. The vein is four feet between walls and the ore will average $15 per ton in gold. A 5-stamp mill is to be erected.——Across Powder river, on the Copper Belt, it is stated that, at the Indiana mine, a crosscut on the 300-ft. level has penetrated 40 ft. of ore that will average $50 per ton in copper, gold, and silver. On the opposite side of the Burkemont, James A. Howard and associates recently acquired control of a property on this belt, and underneath a gossan capping have uncovered a big lode of copper ore of a promising character.——The North American property, which occupies a central position on this belt, and which for the last year has been in process of development is on the eve of changing hands. A bond for $1,500,000 has been executed by the company to New York capitalists, on an option extending to January 1.

Baker City, Dec. 15.

JOSEPHINE COUNTY.

Development work is being pushed in the Briggs mine, at the head of Sucker creek, near Grants Pass, and up to date aggregates about 1,200 ft. of sinking and driving. Three separate lodes are exposed, running nearly parallel. The first of these is the one on which the rich strike was made in 1904, and is about eight inches wide, giving phenomenal returns in places. The second vein is large, about 20 ft. wide, giving an average assay of $8 per ton in free gold, besides concentrate. The third vein was discovered in cross-cutting what was thought to be the lode-walls. This cut has been driven 70 ft. and is still in ore, assaying about $20 per ton, mostly in sulphides. A projected wagon-road will facilitate development and equipment of this property, as the remoteness of the place and difficulty of transportation impede progress. In winter it is impractical under present conditions to bring in supplies for more than a small force of men. With the completion of the road, machinery will be installed for the erection of a stamp-mill of large capacity.

Personal.

W. S. NOYES is at Chicago.

J. H. MACKENZIE is at Seattle.

J. W. MERCER is in San Francisco.

MARTIN HELLER is also in San Francisco.

EDGAR RICKARD has returned from New York.

PHILIP L. FOSTER is expected at El Oro, Mexico.

E. G. SPILSBURY has returned to New York from Europe.

WILLIAM FRECHEVILLE has returned to London from Johannesburg.

RUDOLPH GAHL is with the Detroit Copper Co. at Morenci, Arizona.

WILLIAM W. MEIN is expected at Oakland from Johannesburg.

GEORGE H. HARRISON, from England, is visiting the West and Mexico.

ARTHUR M. DAY is superintendent of the Yampa smelter, at Bingham, Utah,

J. R. DELAMAR is in San Francisco in connection with important litigation.

JOHN EDWARDS has resigned as manager of the Pierfitte mines, in the Pyrenees.

MARK R. LAMB has gone to Mexico City and will visit Guanajuato and El Oro.

ALBERT BURCH is an expert in the Champion-Home litigation at Nevada City.

B. F. GRANT is with the Palmarejo & Mexican Goldfields Co., at Chinipas, Mexico.

WILLIAM B. PHILLIPS is investigating mineral properties in Arkansas and Texas.

W. L. COBB has returned to San Francisco from examining mines near Death Valley.

BERTRAM HUNT has returned to San Francisco from a visit to Glasgow and London.

E. H. GARTHWAITE expects to visit California from Rhodesia at the end of the year.

W. N. BURKE has been appointed manager for the Braden Copper Co., at La Junta, Chile.

WILLIAM C. RALSTON is the newly elected president of the California Miners' Association.

EDWIN E. CHASE has returned from Arizona and has left Denver again to go to California.

R. R. LUND is chemist and assayer for the Old Union Mining Co. at Breckenridge, Colorado.

ROBERT J. COLEMAN has been appointed manager of the Lluvia de Oro mine, in Chihuahua, Mexico.

WALTER W. JOHNSON has returned to Berkeley, from dredging operations on the Snake river, Idaho.

CHAS. F. NOURSE is now at 448 Market St., San Francisco, with the firm of Nourse & Farey, civil engineers.

THOMAS KIDDIE has been appointed manager of the Hadley smelter, on Prince of Wales Island, British Columbia.

DAVID H. LAWRANCE, of Denver, has just returned from making examinations in the Black Hills district of South Dakota.

RUPERT C. ALABASTER has left the Etruscan mines, in Italy, and is in England, preparatory to accepting a new appointment.

EZEQUIEL ORDONEZ has resigned as sub-director of the Geological Institute of Mexico and is now in practice as a mining geologist at Mexico City.

W. F. GUNN is now on a visit to San Francisco. He leaves shortly for Culiacan, in Sinaloa, Mex., to act as agent for the National Metal Company.

CHARLES O. ELLINGWOOD, of Salt Lake City, has resigned as secretary and manager of the Western Exploration Co., and goes to New York with the National Development Company.

Obituary.

ARTHUR K. BOHN, a mining engineer well known in Colorado and Mexico, died of diabetes at Los Angeles, Cal., on November 25, after a short illness. Mr. Bohn was the oldest son of Major A. V. Bohn, of Leadville, Colo., and had been associated with various companies in Montana, Colorado, and Mexico, having resided at Sierra Mojada, Mexico, from 1894 to 1900. He had again been in Mexico for the last two years in an endeavor to establish a zinc smelter in the Republic, but had returned to the States with the intention of settling in Nevada, when he was taken ill and died at the age of 41 years. His brother, J. V. Bohn, is in southern California, and the other, C. A. Bohn, is at the City of Mexico. Both are also mining engineers.

L. Vogelstein & Co., New York, state that the German consumption of foreign copper for the months January to October, 1906, as compared with 1905, was:

Imports during October	11,321 tons.	
Exports " "	946 "	
Consumption	10,375 "	
Imports of copper, January to September	99,230 tons	
" " " October	11,321 "	—110,551 tons
Exports of copper, January to September	7,890 "	
" " " October	946 "	— 8,836 "
Consumption of copper, January to October, 1906		101,715 "
" " " " " " 1905		82,215 "

Out of the above, 9,253 tons of copper were imported from the United States during the month of October.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, December 20.

Argonaut	$4.90	Furnace Creek	$4.00
Con. Virginia	1.12	Savage	1.02
Mexican	0.89	Sierra Nevada	0.72
Ophir	3.12	Yellow Jacket	1.17
Belmont	5.50	Montana	3.88
Jim Butler	1.37	Mohawk	13.50
Jumbo	3.35	Red Top	3.45
Jumping Jack	0.50	Sandstorm	0.70
Manhattan Con	0.85	Silver Pick	1.22
Midway	2.45	Tonopah Ex	5.80

ANGLO-AMERICAN SHARES.
Cabled from London.

	December 13. £ s. d.	December 20. £ s. d.
Camp Bird	1 9 0	1 8 3
El Oro	1 7 0	1 6 9
Esperanza	2 15 6	2 11 0
Dolores	1 7 6	1 7 6
Oroville Dredging	1 0 6	1 0 3
Stratton's Independence	0 3 0	0 3 6
Tomboy	1 12 6 ex. div	1 12 6

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.

	Closing Prices December 13.	December 20.
Copper—Lake (cents per lb)	22.80@23.10	23.23 @23.40
" Electrolytic "	22.35@22.60	22.79 @23.04
" Casting "	22¼	22⅜
Lead "	5.75	6
Spelter "	6.50@6.55	6.58 @6.63
Silver (cents per oz.)	68⅜	68⅜

CURB QUOTATIONS—NEW YORK.

	Closing Prices Dec. 6.	Dec. 20.
Bingham Central	1⅝	1¾
Boston Copper	31	30½
Calumet & Arizona	169	164
Cumberland Ely	12⅜	11⅞
Dolores	8	8¼
El Rayo	6⅜	6½
Guanajuato Con	5	4⅞
Giroux Con	10¼	9⅛
Greene Con	26⅛	31¼
Nevada Con	19	17⅞
Nipissing	17⅛	13¼
Tennessee Copper	48½	47½
Tonopah Ex	6⅛	5⅜
Tonopah-Belmont	6⅜	6½
Tonopah	20¾	20
United Copper	73⅜	71
Utah Copper	35¼	32

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE underground workings on the Comstock lode at Virginia City, Nevada, aggregate more than a total length of five hundred miles.

IT now appears probable that one gram of radium diminishes in weight about one-half milligram per annum; at this rate of dissolution a gram would last about 2,000 years.

THE reverberatory copper furnace, with its neutral atmosphere, produces a richer matte from the same ore-charge than a blast-furnace which has a powerfully reducing atmosphere.

POWER of water for removing gravel, etc., is in proportion to the square of its velocity and the square of its velocity is proportionate to the grade if the hydraulic radius is the same in each case.

TELLURIUM, which occurs native at the Good Hope mine, in Gunnison county, Colorado, is a silver-white metal, like tin, but it has a marked crystalline structure. It has a very limited use in the arts.

THREE KINDS of material are considered practicable in building smelter stacks, namely, reinforced concrete, steel lined with brick, and radial brick. In the last the sides of the bricks are laid in line with the radius of the circular cross-section of the stack.

THE separation of matte and slag depends mainly upon the difference in their specific weight. Hence, it is difficult to keep the copper low when basic, ferruginous slags are produced, while an earthy or silicious slag is usually very free from grains of matte.

A STRIKING EXAMPLE of a rise in mining shares is afforded by the case of the Sierra Nevada mine on the Comstock lode which, in 1882, rose during eight months from a price of 50 cents per share to a maximum of $275—so that an investment of $1,000 would have brought $550,000 in less than one year.

THE Main Reef series of gold-bearing beds of conglomerate on the Rand has been traced for a distance of about fifty miles. Claims have been taken up for a width of 2 to 3 miles. Litigation over territory is unknown because the law of the apex is not in use; acreage, not apex, gives title to the ore.

CORUNDUM AND THE SAPPHIRE are essentially identical in composition; they are alumina, the oxide of aluminum. The sapphire is the transparent form of this substance, corundum is the opaque variety. Emery is a mechanical admixture of corundum and magnetite. It is the presence of corundum in the emery which gives it value as an abrasive.

ASSAYS are not commonly made at the gold mines of the southern Appalachians. Usually the value of the ore is measured only by the recovery on the plates and by chlorination. As ore from several orebodies is run through the mills promiscuously, it is difficult to determine the value of any specified lot. The system appears incredible to Western operators.

THERE are many ways of working coal nowadays, and, in order to come to a decision as to the best mode of working, an engineer must know (1) quality and nature of roof and pavement; (2) quality and thickness of coal; (3) quality and quantity of ribs of refuse in seam; (4) inclination; (5) whether gassy or not; (6) depth from surface; (7) nature of surface as regards property, rivers, reservoirs, etc.; (8) whether the field is faulty or not.

THE paper of the late Professor Curie on 'The Effect of Temperature on the Magnetic Properties of Bodies' led to the discovery of the law that for feebly magnetic substances the coefficient of magnetism varies inversely as the absolute temperature. He also pointed out that the magnetization of diamagnetic substances appeared to be independent of the temperature and physical state, indicating diamagnetism as an *atomic* property.

THE electrolytic refining of copper was one of the great discoveries of the age, for it became the foundation of modern electrical engineering. Without copper of high conductivity, the dynamo, the telephone, and the transmission of power would not exist in their present forms. To Edward Balbach and his assistant, F. A. Thum, who originated the electrolytic refining of copper in 1883, a great debt is owing from the industrial world.

LITHIUM is used in the manufacture of lithium carbonate; this is the basis of the lithia waters, which are regarded as having good medicinal effects. Lithium, in the form of the oxide, lithia, is derived from lepidolite and spodumene. The former occurs in large deposits at Pala, San Diego county, California, and the latter is chiefly obtained from the Etta group of mines, in the Black Hills of South Dakota.

ALUMINUM PAPER is now manufactured in Germany, and recommended as a substitute for tin-foil. The paper is used as a sort of artificial parchment obtained through the action of sulphuric acid upon ordinary paper. The sheets are spread out and covered upon one side with a thin coating of a solution of rosin in alcohol or ether. Evaporation is hastened by means of a current of air, and the paper is then warmed until the rosin has again become soft. Powdered aluminum is then sprinkled upon it, and the paper subjected to strong pressure.

LOSSES IN CONCENTRATION.—The following general rules are useful in deciding as to conditions favorable to small losses:

(1) If the ore is fairly hard and breaks without the formation of dust.

(2) If the valuable mineral of the ore is heavy and easily detachable from a lighter gague.

(3) If the ore can be sorted by hand-picking so that but little is sent to the mill for concentration.

On the other hand losses will be high when:

(1) The mineral and gangue are finely knit (composed of fine grains uniformly aggregated).

(2) The ore is so friable as to disintegrate under the action of water treatment.

(3) Mineral and gangue are nearly of the same density.

(4) The mineral is scattered through a hard gangue so that it gets ground up more than the gangue, especially if finely ground.

(5) The ore, as in the case of certain copper carbonates, is high grade.

In general ores containing native metal or sulphides are better suited to concentration than the oxidized or carbonate ores. As regards physical character, the coarsely knit ores work the best. The eye alone is not a sufficient guide, and nothing but a practical test will determine whether or not an ore can be economically concentrated.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

Cyanide Practice at Kalgoorlie.

The Editor:

Sir—I considered it a fortunate moment when a copy of your issue of July 28 came into my hands, and enabled me to read with interest and also a little amusement an article by Mr. Alfred James on 'Crushing and Grinding Practice at Kalgoorlie.' As you mention that any reply to Mr. James' criticisms will be given a courteous hearing, I trust that it will be so in this instance.

With the exception of a few remarks in the first part of the article in question, there is little to disagree with, but it is when Mr. James leaves general views, and gets down on to more detailed work, that he appears to lose his balance, especially in regard to his criticisms on the tests made at the Ivanhoe mine, at Kalgoorlie, between grinding pans and tube-mills. Although I left the service of that company in March last, it is natural that an attack (like the one now under review) on those experiments, which were carried out by Mr. R. B. Nicolson and myself, should evoke a reply.

Taking that part of Mr. James' paper which relates to pans against tube-mills, he opens with a reference to a mysterious mine at Kalgoorlie, that is practising bromo-cyanide treatment without using bromo-cyanide methods, and in consequence the residues of this mine are reputed to be worth 2½ dwt. per ton. With the exception of the loss in residues, I have a shrewd suspicion what the name of the mine is, but would certainly advise Mr. James to call at headquarters, and get correct figures for the past few months, which are—I dare to say—considerably under his estimate.

The question of extraction was entirely left out of the Ivanhoe tests. The point to be proved was, which was the superior grinder, a pan or a tube-mill. Personally, I think very little difference would be found in the extraction obtained from the slime made by either of these two machines.

I am glad to see Mr. James regrets that names of such high standing should have been tacked on to tests so badly carried out as were those at the Ivanhoe. While appreciating the compliment in the first part of this sentence, I would also apply the same remarks to Mr. James and his article. This same gentleman, by a wonderful though erroneous deduction, then discovers that as the Ivanhoe tube-mill worked on alternate days, the flints were coated with slime at the start of each daily test! For Mr. James' benefit alone, I would inform him that at the end of a day's run of the tube-mill, the feed was shut off and clean water passed through for some time before the mill itself was stopped, and on re-starting for another day's run the mill was allowed to work for some time until its full load was reached before samples of any kind were taken. Setting aside this precaution, the fate of any slime left inside a tube-mill revolving at 32 revolutions per minute can be imagined.

Mr. James now comments somewhat sarcastically on the large amount of 'slime' (?) (–150 mesh) which is allowed to return to choke the tube-mill instead of being got rid of at once, and shows that the Ivanhoe mill had more slime returned than was its daily output of this product. The statement made in the Ivanhoe report that the tube-mill became choked, has been taken perhaps in too literal a sense. It is obvious that as long as the inlet and outlet of a tube-mill is large enough, practically any tonnage of sand can be rushed through. What happens in a case of this kind is that the various spitzkasten used for separating the resultant slime and feeding the mill are gradually choked by the accumulation of fine sand returned for re-grinding, the effect of the tube-mill having more original feed than it can cope with, or, in other words, the mill may be said to be 'overloaded.' This is what happened during the Ivanhoe experiments. The tube-mill did not exactly choke, but the various spitzkasten employed did, and after every expedient failed the fine sand was only prevented from gradually gaining on the mill by reducing the amount of original feed. As there is a certain time at which a tube-mill must become overloaded, that particular point was naturally presumed to have been reached. The same remarks also can be applied to the grinding pans.

At this point it may be as well to get an idea of what Mr. James does consider good work by a tube-mill, and I have gone to some trouble in turning up a few statements made by him during the last few years, and in one of them in *The Engineering & Mining Journal* of January, 1905, I notice he makes the following remarks:

"I ask why is it that the Hannan's Star mill, the first one laid down, should be still doing the best work, while the Ivanhoe mill has been thrown out?" And further on we have: "The longest and oldest mills, those at Hannan's Star, and the old Brownhill exhibit the best results, etc."

Turning now to the *Journal of the Chamber of Mines* of Western Australia of March, 1904, we see some working results of this same Hannan's Star mill, which Mr. James appears to never tire in quoting. A glance at this latter paper reveals, in the light of present remarks, some astonishing figures, and I shall trespass a little on your space to reproduce them alongside those of the Ivanhoe. Before giving these it must be remembered that the Hannan's Star tube-mill was 16 ft. long, taking 30 h.p., and was reducing 38 tons of sand per day to a slime of –150, while the Ivanhoe mill was 13 ft. long, requiring 20 h.p. and bringing 19.5 tons of sand to a slime—also of minus 150. It may be added that of the original feed of 38 tons sent to the former mill, 20.5% remained on 40 mesh, while of the 19.5 tons sent to the Ivanhoe tube, 51% stayed above 40 mesh, or, in other words, the original feed to the Ivanhoe mill was 2½ times as coarse as that sent to Hannan's Star. As it was demonstrated, in tests carried out at the former mine, that coarse sand had a bad effect on tube-mill work, this fact, taking the size of the two tube-mills into account, explains most of the difference in output.

As 'slime' (?) in the return feed is the product that worries Mr. James so much, I give below the grading from the two tube-mills:

	Hannan's Star mill (16 ft.) 268 tons per day, being original feed and sand returned for re-grinding.		Ivanhoe tube-mill (13 ft.) 142 tons per day, being original feed and sand returned for re-grinding.	
	%	Tons.	%	Tons.
On 40 mesh	4.5	12.06	11.40	16.19
" 60 "	9.5	25.46	14.98	21.27
" 100 "	19.9	53.33	36.94	52.46
" 150 "	19.0	50.92	17.77	25.23
Through 150 "	47.1	126.22	18.91	26.85

A glance at the above figures shows that the Hannan's Star mill with an original output of 38 tons of –150 mesh slime per day contained in its return feed no less than 47%, or 126 tons of this same objectionable product, against the Ivanhoe mill with an original output of 19.5 tons, containing only 18.91%, or 26.77 tons. In other words, we have the extraordinary position of a man who for the last few years has been holding the Hannan's Star tube-mill up to the admiration of the mining world, executing a complete somersault, and condemning the tube-mill practice on a neighboring mine, when on his own showing this latter mill is doing far better work, espe-

cially as far as clean separation goes, than the one he is so proud of. It is unfortunate that Mr. James has allowed personal feelings to obscure his judgment on this occasion, and if he now puts the Hannan's Star mill figures in the place of the Ivanhoe, it is evident in what an unfortunate position he has placed himself.

As it is hardly necessary to comment any further on this, we will now go on to another paragraph in the paper under review where complaint is made that the pans—especially the first one—had an undue advantage over the tube-mill in matter of getting rid of finished product. Surely Mr. James does not condemn the practice of running the original or coarse feed into one pan and the return fine feed into a second to be slimed. This is one of the advantages of pans over tube-mills, as in the case of the latter one machine has to both reduce coarse sand and do the sliming as well. However, if Mr. James had looked at the feed entering the second or finishing pan he would see that out of a daily tonnage of 74.6 tons returned to this pan no less than 24.5 tons passed 150 mesh (being nine tons more than its actual output of this product), or, in other words, this pan had practically the same quality of feed as the tube-mill, so that both were laboring under the same disadvantage. It may be consoling to the gentleman in question that all tube-mills and pans grinding to a slime exhibit the characteristic of having more –150 'slime' (?) returned to them than is their actual output of this product, and it is, I should say, the result of not having a proper definition of what constitutes slime, and a better plan for separation of the same. Numerous attempts have been made of late to define what slime is, but so far the results have not been satisfactory. The common and practical definition at Kalgoorlie is: All that product which passes a screen having 150 holes per linear inch. This, however, is far from satisfactory, for anyone conversant with grinding practice knows how large is the quantity of very fine sand that will pass a 150 mesh readily, but is yet heavy enough to sink in a spitzkasten, and be returned to the tube-mill or pans again and again. Recognizing these difficulties, it was stated at the outset of the Ivanhoe experiments that all that product which passed a 150 mesh would be called 'slime,' whether it came from a tube-mill or grinding pan. As some basis had to be made for comparison, this was thought to be the fairest, and the returned slime which causes Mr. James so much worry is in reality very fine sand. In the Ivanhoe report the return feed is spoken of in every instance as 'sand,' and, as shown, both tube-mill and pans had their complement of it. If in place of writing contradictory statements, Mr. James would set himself the task of defining what slime is, and, having satisfied the mining community on that point, he then invents some simple appliance which would eliminate that slime, and only sends back to be re-ground that part which according to his definition required it, then perhaps further trials may be undertaken between grinding machines that would satisfy even the most critical.

The fact of the Ivanhoe tests being checked by a tube-mill expert sent by Messrs. Bewick, Moreing & Co., from the Oroya Brownhill mine, is sufficient to remove any chance of bias on the part of those responsible for the figures given.

Coming now to the cost allowed for flints and liners—which Mr. James remarks as being excessive—, I can only state that the costs shown were based on the consumption experienced during the progress of the experiments and which agreed closely with results obtained on a large scale on neighboring mines, and that, as shown later on, the longevity of liners in the Kalgoorlie district is unique. Leaving out the difference in wear and tear of working parts, the question of a pan being superior to a tube-mill in breaking down coarse sand is so evident that it is hardly worth discussing.

It comes as a surprise to those unacquainted with fine-grinding operations at Kalgoorlie that iron liners should still be in use, but when we consider the records put up there on hard sulphide ore, one-inch iron liners lasting from four to six months, or longer than three-inch silex liners do on the Rand, it is perhaps no wonder that Kalgoorlie metallurgists are reluctant to discard such a useful friend. The reason for the great difference in wear in liners between two such important mining centres is worthy of careful investigation. From knowledge of both Kalgoorlie and Rand practice I would say that the sand of the latter place is much sharper, and also the fact that the product entering the tube-mills on the Rand is coarser on account of it practically only passing through once, while Kalgoorlie mills in grinding to a slime have a large percentage of original feed returned again and again, and in consequence the feed entering them is much finer. Another peculiar circumstance is that, while it is difficult on the Rand to find a tube-mill under 22 ft. in length, in the whole of Western Australia there is no mill over 16 ft., the majority being but 13 ft. long!

A practical proof of the esteem in which grinding pans are held is that about 200 are now engaged in Western Australia, 40% of this total in grinding raw sand, admittedly not to a slime, for those mines which are sliming their total product had tube-mills erected or on order before the remarkable grinding ability of pans was recognized; but where it has been decided to increase the capacity of these latter plants, pans have invariably been installed in preference. It is perhaps worthy of notice that about a dozen have also arrived or are on their way to South Africa.

It is a matter of sincere pleasure to those responsible if in the smallest degree the increased use of grinding pans has been due to the Ivanhoe experiments, and also the recommendation to millmen of a grinding machine that (to use Mr. James' own words) has the advantages over tube-mills of "using less horsepower per unit, their greater convenience in working, their capacity for amalgamation, the granular (?) nature of their product," and it may be added (until demonstrated otherwise) their undoubted superiority in breaking down coarse sand, and their more than equal success in sliming.

H. T. BRETT.

Sabiwa Mine, Gwanda, Rhodesia, October 4.

Milling Gold Ores.

The Editor:

Sir—Mr. Algernon Del Mar, in his valuable contribution on stamp-milling in your issue of November 17, emphasizes the superiority of the single stamp, as a mere crushing device, over the five-stamp system. This appears to confirm the claims made by the inventor of the Nissen stamp in your issue of April 25, and raises a question of the greatest significance and interest. According to Mr. Del Mar, the single stamp, by virtue of its more extended screen-area and the facility with which the pulp is ejected, will crush more than one of the units of a five-stamp battery operating under the most favorable conditions. The writer further asserts that the gain in crushing capacity more than compensates for the increased labor and wear attending the operation of the single unit. These statements suggest the query: Will not the single stamp eventually supplant the present type of battery in all cases where inside amalgamation is unimportant, and where a maximum crushing capacity is desired? A significant fact in this connection, and one which no fair-minded engineer will ignore, is that a very large battery of single stamps is now being

installed at one of the Utah smelters, after what purports to be a fair competitive trial. I am informed that several smaller orders have been placed for single-stamp mills in Nevada and elsewhere.

This is a subject which merits the serious attention of millmen and a most thorough discussion. I am not aware that any data has been published on the single-stamp battery in actual service. In a mill at Goldfield three Nissen stamps are doing hardly better service than ordinary stamps, and much less than was expected of them.

It would be interesting to know the experience of millmen who have operated the single stamp. The subject is one of great interest to metallurgists; and in view of the apparently extravagant statements made by manufacturers of the single-stamp battery, we should have complete and authentic information.

F. L. BOSQUI.

San Francisco, December 8.

Architecture in Mining.

The Editor:

Sir—In your issue of September 1, you have a short article entitled 'Architecture in Mining,' the purport of which is to draw the attention of the mining fraternity to the lack of adornment in their mine and mill buildings.

It is true that in English-speaking countries in mining structures very little thought is seemingly given outside of practical utility; and in such an industry as mining—where often lack of assurance of a long life combined, at times, with an out-of-the-world location are important factors—I am not sure that this attitude is altogether amiss or that it could be advisedly amended by the introduction of 'architecture' in mining. Coming from such an ornate-loving people as the Spanish-Mexican and being familiar with the richly ornamented design of almost all their constructions, it certainly does strike one that the Northern nations might yield a little more practicability to elaboration. But whatever I may at one time have thought of this subject, I confess I am no longer of uncertain mind since coming to the Czar's Holy Empire, for here ornamentation is carried to excess and both masons and carpenters seem never so happy as when they are developing an ornate cornice or fluting a door or window, or putting in some 'frill' or other, and this with no respect to the manner of work or building. Hence the curious anomaly of the boilers reposing in a palatial stone front and the writer inhabiting an humble adobe, which might be forgiven had not these unessential features consumed an abnormal period of a short working season.

My old father-in-engineering used to impress on me that "what is best looks best," and I am of the opinion there is a whole lot of truth in that homely maxim.

Take the examples given of 'La Presa de los Santos'. These pedestaled images really are, pure and simple, 'excrescences' and form no part of the dam proper at all (however well they may illustrate its euphonious appellation), any more than the old-fashioned figurehead epitomized the graceful lines of a clipper-ship. The easy flowing lines of a finely designed ship are beautiful in themselves and need no such appendix as a figurehead. The sinuous curves of a well-designed dam afford both a practical construction and become a veritable poem in stone. Barnacles would not improve the former nor graven images the latter. Nay, rather one would detract seriously from the speed and the other be disturbing to an appreciative contemplation of a simple scientific construction. After all is said and done, mining is a practical business. Good engineering is not only qualified by the work done, but he who can achieve the same result at the lesser cost—without sacrificing any essential—is assuredly the better engineer. Monetary consideration is usually, if not all important, still the most important. Times have changed and mines are worked out as rapidly as is consistent with their magnitude. Elaboration was all very well when the wheels of time ran slowly—now utility is the foreword.

On the other hand, I am of the opinion inasmuch as we follow nature, which happily combines practicability with simple beauty, and seems to abhor a straight line as it does a vacuum, that always when one design is as cheap as another—and there remains but the matter of the personal equation—a refinement in taste is to be preferred and commended to a tasteless utility.

Simplicity of design, not elaboration, is the mark of the highest refinement, not only in the individual, but relating also to the construction of materials. Taste, therefore, in design rather than ornamentation, and scientific construction rather than 'architecture', which, according to the maxim I have given, if it "is the best, will look the best".

H. E. W.

Akmolinsk, Siberia, October 28, 1906.

PRODUCTION OF TIN.—The use of tin is steadily increasing and the demand for it is constantly growing. While new localities are being discovered from time to time, and while certain of the districts already known are increasing their output, some of the important tin-producing regions of the world are on the decline and others do not give promise of long maintaining their present production. The reserve stocks held in various parts of the world are accordingly being greatly depleted and the price of tin is gradually rising. For these reasons the discovery of a new tin locality is of much interest to mining men, and to many who are more or less directly connected with the metal industry, as well as to investors. The fact that the United States consumes over 40% of the world's output while contributing an inappreciable amount makes of especial interest any information regarding a tin locality that gives the least promise of becoming economically important. Previous waves of excitement have arisen on several occasions, only to wane and finally die out because of the failure to demonstrate the presence of valuable tin deposits. South Dakota, Missouri, California, Virginia, and Alabama afford notable instances of this and the Carolina tin belt itself has once risen to prominence and then almost passed from memory. Within the past couple of years interest has been revived in this region and it is now attracting a good share of attention from the outside, while within the tin-bearing territory considerable excitement prevails.—L. C. Graton, U. S. Geological Survey.

ELECTROSTATIC SEPARATION OF ORES.—When a particle of galena or pyrite that is a good conductor passes through an electrostatic field of great intensity, its potential is zero, but when it comes in contact with a charged pole it instantly rises to the same potential, and as equilibrium is established repulsion takes place. A particle of mineral that is a non-conductor, such as quartz or blende, on striking a charged pole is slow to assume the same potential and little or no repulsive force results. The ferro-magnesian minerals and others of medium conductivity possess intermediate characteristics. On these phenomena depend the principles of electrostatic separation. Although induction modifies this effect somewhat, the above principle is that on which the many types of electrostatic separators depend. In this process, which must not be confused with magnetic separators, the ore must be dry and finely powdered so that the particles of each mineral are freed.

The Later History of Guanajuato.

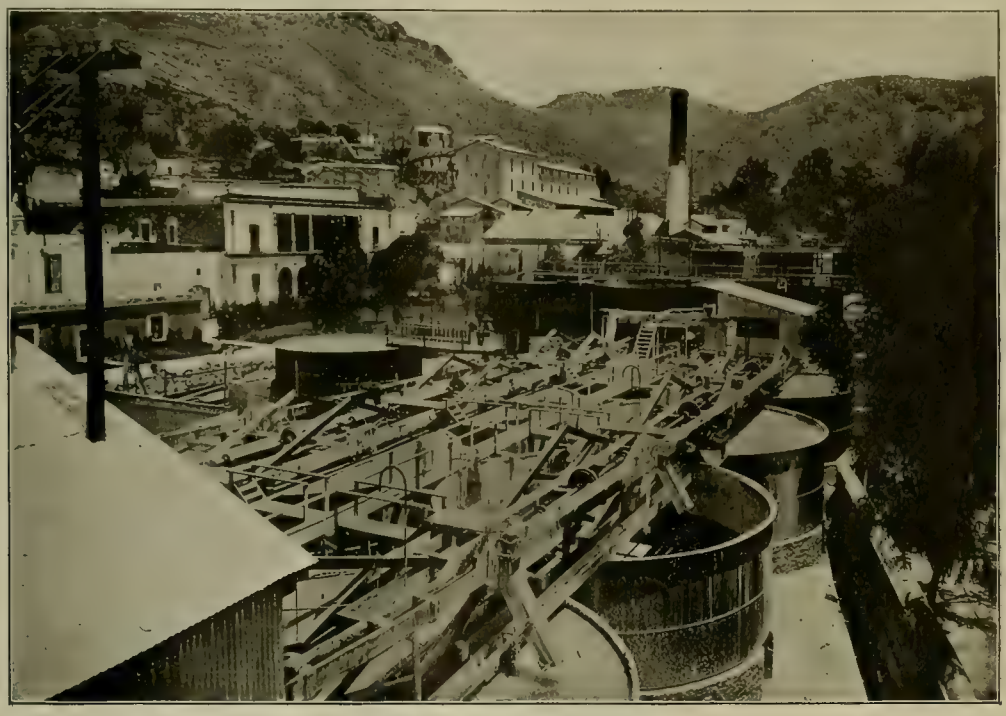
Written for the MINING AND SCIENTIFIC PRESS
By T. A. RICKARD.

The mines of La Luz were in bonanza in 1812 and for many years after, so that Guanajuato itself became less important, but twenty years later Francisco Glennie took charge of the Rul estate and by his skill he made these mines on the Veta Madre more productive than they had been at any time since the palmy days at the close of the eighteenth century. The Valenciana was unwatered to the bottom at 1,800 ft. and a new orebody was discovered in the Merced* vein. At the same time Glennie developed the Cata mine and found the rich Juanita* vein. When he became invalided, in 1890, another period of depression ensued at Guanajuato. All the company work at the Valenciana was stopped and the water was allowed to rise. At the Cata, the water was kept down, but here, as at the Valenciana, the workings were handed over to the tender mercies of the *buscones*. These are tributers on a small scale, that take a lease from week to week without any written contract and divide the ore they get with the mine-owner, who provides the tools, powder, and blacksmith. On each Saturday morning the *buscon* sorts his ore, arranging it in two equal piles, of which the foreman takes his choice on behalf of the owners of the mine. Of course, the *buscon* cannot afford to explore, he does no dead work; and as he moves no more waste than is necessary, the workings soon become choked with refuse. He nibbles at every pillar left to support the old stopes, and causes caving that will close the mine or portions of it, permanently.

And so mining came down to a dreary unprogressive level, with no new work and no fresh discoveries of ore, until in 1898, another revival was inaugurated by the enterprise of a few Americans. In that year the Guanajuato Consolidated Mining & Milling Co. secured the Sirena mine and erected a modern mill, under the direction of M. E. MacDonald, assisted subsequently by his brother, Bernard MacDonald.

In 1902 the Guanajuato Power & Electric Co. was formed by a group of mining men at Colorado Springs, on the initiative of Leonard F. Curtis; he was ably supported by George Bryant and George W. McElhiney, to whose financial ability are due several of the most important enterprises in the district. As fuel of any kind was very expensive, the introduction of power at a reasonable price was an important step in the progress of mining. This was accomplished in November, 1904. The electric energy now used at every large mine in the Guanajuato district is obtained from the river Duero, in the State of Michoacan, 101 miles distant. This power at 185 *pesos* per h.p. year† replaced wood at 8 to 10 *pesos* per metric ton and stone coal, from Las Esperanza, in Coahuila, at 20 to 24 *pesos*, delivered.

The next enterprise of importance to be started was the Guanajuato Reduction & Mines Co. The history of the mines that it acquired has been mentioned, they included the property originally belonging to Obregon, the discoverer of the Valenciana, and from his descendants by intermarriage they passed to the noble family of Rul. In 1860 the Señora Perez Galvez, then head of the house of Rul, began a clever campaign, the purpose of which was to obtain *avios* or perpetual leases on these mines, including the Valenciana, Cata, Tepiac, and Mellado. By the *avio* she was able to charge all expenditures against the mines, crediting them with the money received from the sale of ore, but by building large works or *haciendas*, she made contracts with herself to purchase the output of ore, deducting high rates for treatment and mixing the rich with the poor ore so that the expenses of mining were always in excess and steadily increased the debt against the mines, while permitting of handsome profits at the *haciendas*. The options to these contracts or *avios* were acquired by Messrs. Bryant & McElhiney, and transferred by them to the Guanajuato Reduction & Mines Co.,



The Reduction Works of the Guanajuato Con. Mining & Milling Co.

*These were special segregations of rich ore in the Mother Lode.

†This is the average price. The lowest price in the district today is $65 per h.p year.

which finally bought them outright. According to Mexican law, if at any time the mines get into bonanza so as to make big profits from the sale of ore, the lessee has the right to take all such profits, without any division with the owners, until the entire accumulated debt—about six million *pesos*—is paid, thereafter dividing the further profits according to the terms specified in the lease; in plain English, the original ownership is a legal figment. Besides acquiring these old contracts, the promoters mentioned had the foresight to 'denounce' or 'locate' claims covering the dip of all the important properties on this part of the Veta Madre; that is, they secured the 'deep levels.' Finally, after expert examinations and reports had been made by such men as Carlos Van Law, Robert T. Hill, and Louis Noble, these properties and all their rights passed under the control of the Guanajuato Reduction & Mines Co., in November,1904.

Since then other ventures have been organized and started, but their story is in process of making and must be left to a later record.

On the morning of November 2,* a party was made to visit the old mines of the Veta Madre. We formed an imposing cavalcade, for it is the custom in Mexico for each horseman to be accompanied by a *mozo*, who serves as groom on ordinary occasions, and is a courier and general servant when going across country to the mines at a distance. These men wear the wide-brimmed *sombrero*, fancy leggings, and big spurs, so that they are picturesque if nothing else, and on an occasion of pleasure such as this was, they gave a touch of gaiety to a group of horsemen, most of whom were as properly accoutred as in Chapultepec or Central Park. There were ten of us, and eight *mozos*, so that when we clattered down the narrow cobble-paved alleys of the old Mexican town, we made noise enough for a regiment, scattering careless wayfarers and awakening echoes under arches that had seen many invasions much less peaceable. The well-bred Mexican is a splendid horseman, but the inhabitants of such a town as Guanajuato are, of course, content to go afoot, so that accompanied as I was by a group of engineers and metallurgists, it occurred to me that there was a simile to be snatched from the scene, the technical man being the fellow on horseback, progressing confidently (usually with less noise), while the rest of the world is content perforce to go on foot. Well, my friends rode several hobbies, not to mention spirited steeds; one of them was the application of the cyanide process to silver ores; and their horsemanship was good either way. On arrival at the lower end of the town, I was shown the Hacienda de Bustos, where the Guanajuato Reduction & Mines Co. is remodeling an old reduction works to the needs of a modern equipment, as the accompanying photograph will illustrate. This *hacienda* is about a hundred years old; in pulling down the walls to make room for the concentrator floor, there was found a system of older unconformable foundations, and in the angle made by two walls of ancient date, the workmen unearthed half a dozen complete skeletons, with a bullet hole in each skull, and so placed as to indicate that the originals were pistoled while lying down. However, this gruesome find did not hold our attention long, for the foundations of the new stamp-batteries and the steel framing of the ore-bins afforded more cheerful subject for thought.

In the erection of the Bustos plant, bedrock was everywhere available, and the heavy masonry walls were built cheaply by Mexican labor, which is particularly skilled in such work. The stamps are of 1,050 lb. weight. The mortars are of El Oro type and weigh 9,000 lb.; they rest upon massive concrete blocks laid in Dyckerhoff cement. The concentrator room is spacious, being covered by a well-designed roof-truss of steel construction. The tailing from the Wilfley tables runs into a concrete launder, which extends down the longer axis of the concentrator room to the centre of it, delivering its contents to a tunnel at right angles and thence to the cyanide annex. While the plant was in course of construction, a 5-stamp battery, with its cyanide annex complete, was being employed for testing the various ores destined to be delivered to the works when finished. Even when the 80 stamps are at work, this small addition will be kept in service, for experimental purposes. In the concentration department of this testing plant there is a Wilfley table, a Gilpin county bumper, and an Overstrom table. After being crushed under the stamps, the pulp passes over one of the three machines just mentioned and then to a sump, whence it is pumped 60 ft. to cone-separators. The sand undergoes percolation in vats 8 ft. deep and 8 ft. diam., provided with the Butters hydraulic distributor. The slime is agitated in vats 9 ft. deep and 8 ft. diam.; one vat using the Hobson aero-mechanical agitator and the other a Butters pump with mechanical stirrers. Thus the testing plant is designed throughout to duplicate the conditions under which the big mill is to be operated.

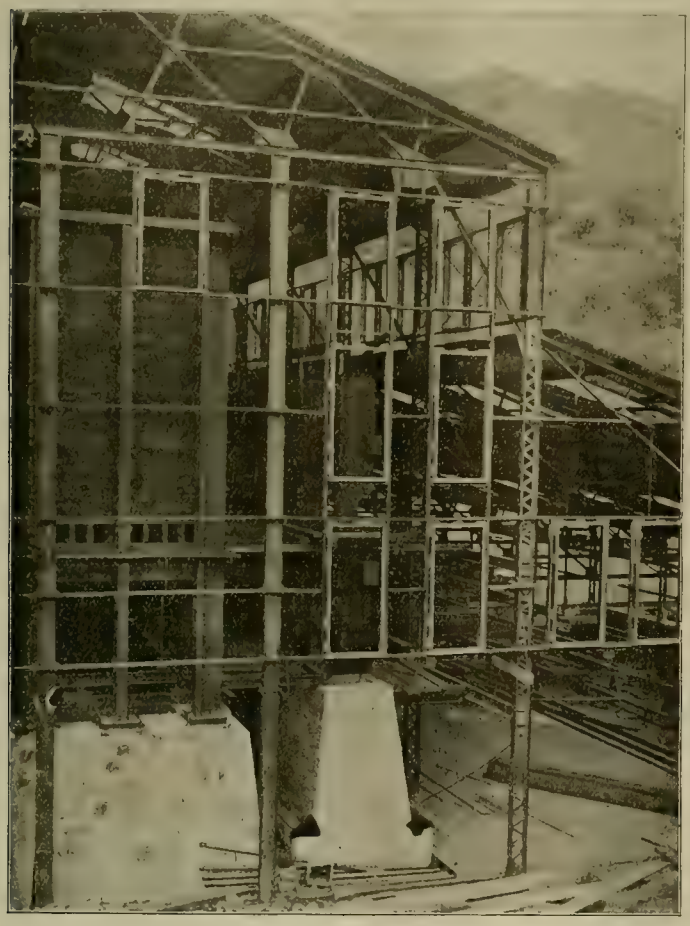
The Bustos mill is planned so that it can be doubled conveniently; in fact, excavations for that purpose were under way at the time of my visit. A sufficient space will be cleared at the back of the existing plant to allow of the erection of a second row of 80 stamps on the other side of the bins. A concentrator room, identical with the existing one, will be added, so as to make the plant a 160-stamp mill of back-to-back construction.

Owing to the high price of American lumber when delivered at Guanajuato, and the poor quality of the Mexican material, it is considered economical to use steel. The skeleton of the bin is of 15-in. channels placed back-to-back in bents which are on approximately 6-ft. centres, the vertical channel posts being tied together at bin-floor level by two 15-in. channels, which are braced from the feet of the posts by inclined struts composed of four 5 by 3½ by ⅜-in. latticed angles. The thrust which these inclined struts carry to the feet of the posts is taken by two 8-in. channels acting as a tie between the feet of the posts, thus trussing the whole and making the strains on the masonry wholly vertical. As the weight in the bin is about 2,500 tons, exclusive of the bin itself, the feet of the columns are supported upon a grillage of six 5-in. I-beams, two feet long, held together by plates riveted to the top and bottoms. This rests directly upon the masonry. All the bents are braced together longitudinally at the top and floor-level of the bin by 8-in. channels and heavy angles; at the ends of the bin the outward thrust upon the bents is taken by a truss-member at the top of the bin. The bents themselves are tied together at the top by ¾-in. plates 4 in. wide, riveted between the channel-beams to the posts. Within this skeleton is a lining of plank, 4 in. thick in the bottom courses, with an inner sheathing of 2-in. plank with the grain vertical. The bin has a flat bottom supported on 4 in. by 14-in. joists on 12-in. centres, carried upon horizontal members of the steel bents before mentioned, on the top of which is laid a 3-in. plank covered by a 2-in. lining. The entire construction does credit to the manager, Mr. Carlos W. Van Law.

While we examined the mill, an interesting discussion arose regarding the comparative value of the mechanical conveyor. Cars were advocated as economical because the cost of power alone (apart from repairs, maintenance, and interest on capital) for the conveyor exceeds the

* In 1905.

expenditure for labor when employing cars *plus* human labor. A conveyor requiring 7 h.p. at $7 per h.p. per month is equivalent to, say, $50 or 100 *pesos* per month. The same work can be done by two *peones* at 50 *centavos* per day, equivalent to 30 *pesos* per month. In case a *peon* wears out, you can get another without absorption of capital! But alas for such calculations, the *peon* does not work on feast days! There is a great advantage in employing machinery that goes forward without any stops. For in Mexico there are 25 *fiestas* per annum that are rigidly observed, besides Sunday and San Lunas or St. Monday—sacred to sobering observance—so that there are at least 75 days of interruption in a year, and wherever laborers are not plentiful, this feature must be taken into account. On the other hand, if one has a bin capable of holding a ten days' supply of ore for the entire plant—as is the case at the Bustos mill—the bad effect of two or three days of *fiesta* is obviated. Of course, where a car-track is impracticable or where elevating is required, the conveyor holds the field—and that is often.



The Bustos Plant of the Guanajuato Reduction & Mines Co. in Course of Erection.

Leaving the Hacienda de Bustos, we rode up a ravine leading to the mines on the great lode of Guanajuato, called the *Veta Madre*, a term which in the guise of 'Mother Lode' has also been applied to the main vein system of California. In the State of the Argonauts it refers to a general zone or belt several miles wide and 300 miles long, but at Guanajuato it defines a distinct lode channel about 600 ft. wide and seven miles long. At the foot of the hill on which stands the Rayas mine, the Veta Madre is crossed by the Cañon de Zapote, and a natural section of the big outcrop is visible. The lode consists here of eight feet of silicified breccia; on the foot-wall, exposed in the bed of the stream, there is a quartz vein traversed by black streaks of argentite that dip at 15°; and under this ore comes brecciated schist cemented by quartz, the latter diminishing until the schist exhibits a ramification (*ramilvo*) of stringers, the dominant members of which are parallel to the foot-wall. Beyond this point, the quartz continues to decrease, and on the further side of the stream the schist appears in the regular lamine to which it owes its name of *hoja de libro*, or book-leaves. This is the main foot-wall country. Remounting our horses, we returned down the cañon, soon reaching the Rayas church, a beautiful remnant of the loving architecture that the Spaniard lavished even on his mines. In these churches are found all sorts of queer pictures celebrating the thankfulness of the donor for deliverance from various perils. In them the miner testified to the danger of his calling, by the tribute offered to his particular saint.

Ascending the hillside overlooking the church and its environing buildings, we turned to look on the crumbling walls of an old *hacienda* that we had failed to notice as we rode past it. The walled enclosures seem inadequate for protection, and yet they served their purpose before long-range rifle practice was developed. Until about twenty-five years ago, brigandage was so rife in this, as in other parts, of Mexico, that the *haciendas* or reduction works were periodically 'held up,' more particularly those in outlying districts. As regards Guanajuato, their special nest was at El Capulin, on the road between Silao and Marfil. They terrorized the country, and despite occasional raids from the military, who drove them into the hills, the bandits would return after a short interval, to resume their depredations. Finally, in 1883, the State Government sent a body of mounted police to clean them up. Sixty men were captured, placed against a wall and shot. El Capulin was completely destroyed; not a hut was left to mark the spot. That ended the business.

Passing close to the flying buttresses of the magnificent walls that enclose the San Miguel shaft of the Rayas mine, we entered the old enclosure. A suggestion of the appearance of this architectural survival is presented by the accompanying photograph.

A little further and we entered the courtyard of the Rayas shaft, one of the four great openings on the Veta Madre. This one is octagonal in shape, and 38 ft. in diameter. The depth is 1,400 ft. Why these shafts were so big and the manner in which they were operated, will be told in the sequel. They make even the most self-confident American miner realize that his science did not begin at Virginia City, nor was it born in Colorado. The Rayas was sunk by the Spaniards in 1850, while the Valenciana shaft is a hundred years old, and yet one can read in the mining papers of forty years ago that there was jubilation on the Comstock when the Ophir shaft reached 400 ft., and that doubts were entertained whether there would be machinery able to cope with any greater depth. Yet eventually the men of Nevada went down 3,250 feet.

Metallurgical Accounts, III.

Written for the MINING AND SCIENTIFIC PRESS
By PHILIP HENRY ARGALL.

METALLURGICAL REPORTS AND ACCOUNTS.—With the receipt of the copy of Inward Receipts Book, Fig. 1, from the Sampling foreman, the Refinery Receipts, Fig. 10, Parting Plant Receipts, Fig. 12, the particulars of ore, bullion, etc.. received by the three departments, such as name of consignor, class, number of bags, weights less bags, date sampled, lot number, disposition, etc. are entered in the Ore Purchase Record, Refinery Purchase Record, and Parting Room Purchase Record. These are kept in an elaborate manner in book form, giving all details and data possible in connection with each lot of ore or bullion. Each lot may be entered numerically, but they may also be classified, for example, consignments coming from a certain locality or State, or from a frequent and large shipper, etc.; but this, of course, gives more work. If these records are kept by one clerk the use of a loose leaf binder with special forms for each department is recommended. Fig. 17 shows a form for the Ore Purchase Record, which has been found to answer all requirements. Records for the other department would be somewhat similar.

The balance of the records is filled in after Fig. 2, Weight & Assay Sheet, has been received from the Laboratory and Settlement and Margin Sheets made out. This gives the first check on the correctness of the work already done, and the weights shown on the Weight & Assay Sheet should be compared with those already entered from the Daily Receipt Sheets.

The Settlement Sheet, Fig. 18, is made out for the consignor, giving full particulars of shipment. To this is attached the Margin Tag by a perforated line, so that it may be torn off. The settlement is made out on the basis of the assay and terms either specially quoted, or those usually in force for the particular class of ore or bullion under process of settlement. This being completed, the total net weight, assay, total contents are carried down to the Margin Tag, and the contents of such lot are figured without deduction of any kind whatever. The price for the contents on the Margin Tag may be estimated, basis of estimation being previous realizations, or it may be figured at the current quotations. From the total amount then shown is deducted the amount due to the shipper, plus any other charges, such as freight, etc., which increases the cost of the lot to the smelter, the balance is the total margin, from which is made the loss or profit, in addition to any gain that may be made on prices at which the refined metals are sold. The margin per ton is found by simply dividing the total margin by the total net dry weight in tons. The figures on both Settlement and Margin Sheets are then checked by another clerk, and if found correct, they are copied, the Margin Tag torn from the Settlement Sheet and sent to the metallurgical clerk. The Settlement Sheet is forwarded in due course through the cashier to the shipper with remittance, and the transaction becomes merged in the financial book-keeping.

The value of the metal contents in the Purchase Records is the value as shown on the Margin Sheets. The total value of the metals should equal the total cost, including all charges, plus the total margin. If these columns do not check, something is wrong, and the work must be gone over again. Each month's cut-off is made to agree with the plant's cut-off, and the purchase as shown by each department, as will be explained later, should correspond with the total purchases as shown in each of the Purshase Records; also the total of the entire plant's purchases should check out the total of the various Purchase Records.

On receipt of the Margin Tags, the metallurgical clerk places them on a file, so that they may be had immediately they are wanted. On receipt of copy of the daily Distribution Sheet Fig. 4, from the metallurgist, showing the bed or mixture to which certain lots have been sent, he proceeds to make up his Bed Sheets. The beds are simply the mixture of certain ores in order to make the smelting operations yield the best results, and the

Fig. 20. PRODUCTION AND SHIPPING RECORD.

REFINED METALS.

Date.	Production.						Shipments.						
	Gold.		Silver.		Refined Lead.		Date.	Consignee.	Gold.		Silver.		Refined Lead.	
	No. of bars ...	Weight.	No. of bars ...	Weight.	No. of bars ...	Weight.			No. of bars ...	Weight.	No. of bars ...	Weight.	No. of bars ...	Weight.

BY-PRODUCTS.

Date.	Production.							Shipments.					
	Smelting Department.		Refinery.		Parting Department.			Date.	Department from	Class of Material.	Department to		
	Base bars.	Matte.	Doré.	By-Products.	Flux.	Slum.	Flue dust.				Smelting.	Refinery.	Parting.

Bed Sheets show the contents and analyses of such ores, together with lot number, name of shipper, cost, and margins. On completion of a bed—that is, when no more lots are added, the mixture is totaled, and the average assay and analyses are shown. This information, if in his Ore Purchase Record in columns provided for that purpose in order to show the distribution.

Roasting mixtures are not completed until after the mixture has been roasted—that is, the average assay and analyses are not calculated out. After such a mixture is

Fig. 19. MIXTURE SHEET.

Date opened ..... Average assay: Gold ..... oz. Silver .....oz. Mixture No .....
Date finished ..... Lead ..... % Copper .....% Bin .....
Average analysis: SiO_2 ..... % FeO and MnO.....% CaO .....% Al_2O_3..... % MgO..... % Zn ..... % S.....%
Class .....

Date to mix	Name of consignor.	Lot No.	Weight. Gross, lb.	H_2O	Net, lb.	Assay. Au	Ag	Pb	Cu	Analysis. SiO_2	FeO—MnO	CaO	Al_2O_3	MgO	Zn	S	Contents. Gold, oz.	Silver, oz.	Lead, lb.	Copper, lb.	Cost. Total	Per ton	Margin. Total	Per ton	Remarks.

made up in time, and regularly, assists the metallurgist not a little in the direction of his operations. It renders useless the separate sampling of mixtures, or making miniature beds, besides keeping a definite and systematic roasted, it should be carefully sampled and assayed. This new assay is used as the average assay for the lots already included in the mixture, and the total contents of the mixture after roasting are figured out on that basis.

Fig. 21. METALLURGICAL BALANCE.

SMELTING DEPARTMENT.

	Gold.	Silver.	Lead.	Copper.		Gold.	Silver.	Lead.	Copper.
Ores, etc., on hand on first of month					Base bullion to refinery				
Ores purchased during month					Matte shipments				
					Ores, etc., on hand at end of month				
Total					Total				
Difference		Gain.			Difference		Loss.		

REFINERY.

	Gold.	Silver.	Lead.	Copper.		Gold.	Silver.	Lead.	Copper.
Base bullion on hand on first of month					Doré shipped				
Bullion received during month					By-products shipped				
Slimes, etc., " " "					Base bullion on hand				
					By-products "				
Total					Total				
Difference		Gain.			Difference		Loss.		

PARTING.

	Gold.	Silver.	Lead.	Copper.		Gold.	Silver.	Lead.	Copper.
Bullion on hand on first of month					Fine gold shipped				
Bullion received during month					" silver "				
					By-products "				
					Bullion on hand				
					By-products "				
Total					Total				
Difference		Gain.			Difference		Loss.		

ENTIRE PLANT.

	Gold.	Silver.	Lead.	Copper.		Gold.	Silver.	Lead.	Copper.
Total metals on hand on first of month					Total metals shipped				
Total metals received during month					Total metals on hand				
Total					Total				
Difference		Gain.			Difference		Loss.		

check on ores smelted, and checking the correctness of the total purchases as made up by the settlement clerk.

The particulars for the Roasting and Smelting Mixtures are taken from the Margin Tags. These tags are then kept together for the time being according to the number of their mixtures. The number of the bin to which the ore is sent, and the mixture in which such lot is put, is passed on to the settlement clerk, and is entered

The difference in the contents of the mixture before and after roasting is either loss or gain in roasting. The gain or loss per ton is shown by dividing the total loss or gain by the total weight of the mixture before roasting. The new weight and contents of the mixture are used in completing the mixture for the blast-furnaces, to which are added any further lots or by-products that may be put in the bed. When completed, the figures

are totaled as before explained, and the average assay and analyses of the mixture are entered in the spaces for that purpose, and the bed is ready for the smelting furnaces. A form suitable for making up the beds or mixtures is shown in Fig. 19.

At the end of each month the metallurgist hands in a list of lots of ore and beds on hand and mixtures roasted and smelted. With this information the metallurgical clerk proceeds to close his Mixture Sheets to-date, and show which have been roasted and which smelted. If only a portion of any of them are used, the amount smelted is shown under the totals of the various columns and deducted, the difference being on hand. Carrying forward the amount of each bed smelted to a separate sheet, they are totaled, the result being amount smelted during the month. All lots of ore not sent to beds, but remaining on hand are listed, and with them are included the mixtures on hand, the result being total stock of ore on hand at the end of the month. These figures would also include all refinery and other by-products received by the Smelting Department from the other departments during the month, which are treated as if they were ordinary ore lots. The total stock on hand at the end of the month, plus amount smelted during the month, less stock on hand at the beginning of the month, should check out to a fraction the total of the Ore Purchase Record. Should it not do so, an error has occurred, which necessitates correction.

Fig. 25. DISTRIBUTION OF STORES.

For month ending .....

Distribution.	Cost of Stores.		Distribution.	Cost of Stores.	
SMELTING.			REFINERY.		
SAMPLING: Tools & Supplies			Blast Furnace Sweater		
Machinery & Cars, etc			Softening Furnaces		
Dynamos & Motors			Desilverizing Kettles		
Oils, Waste, Lubricants			Antimony Furnace		
Scales & Platforms, Hoists			Zinc Sweater		
Miscel			Retorts		
ROASTERS: Tools & Supplies			Pots, Moulds, Cars		
Machinery & Cars			Crucibles		
Dynamos & Motors			Machinery		
Scales & Hoists			Scales		
Oils, Waste, Lubricants			Tools & Supplies		
Miscel			Cupels		
BRIQUETTING: Tools & Supplies			Market Lead Ketties		
Machinery & Cars			GENERAL: Tracks & Runways		
Dynamos & Motors			Flues & Stacks		
Oils, Waste, Lubricants			Fire Apparatus		
Scales & Hoists			L'bty, & Assay Tools & Supplies		
Miscel			Office Supplies		
CRUSHING (other than Sampling)			Lights		
Tools & Supplies			Bdg., Bins, Fences		
Machinery & Cars			Miscel		
Scales & Hoists			POWER: Boilers, Pumps, etc		
Oils, Waste, Lubricants			Engines, Dynamos, Motors		
BLAST FURNACES:			Oils, Waste, Lubricants		
Tools & Supplies			Miscel		
Water Jackets			Total		
Blast Furnaces			PARTING.		
Elevators & Slag Hoists			Furnaces		
Settlers			Kettles		
Pots & Moulds, Cars			Tanks		
Matte Moulds			Pots & Moulds, Cars		
Matte Tools & Supplies			Machinery		
Mechanical Feeders			GENERAL: Tracks & Runways		
Loco. & Motors			Flues & Stack		
Machinery & Cars			Fire Apparatus		
Scales			L'bty & Assay Tools & Supplies		
Oils, Waste, Lubricants			Office Supplies		
Dump Tools & Supplies			Lights		
Horse Feed			Bdg, Bins, Fences		
Harness, etc			Miscel		
Miscel			POWER: Boilers, Pumps, etc		
GENERAL: Tracks & Runways			Engines, Dynamos, Motors		
Flues & Stacks			Oils, Waste, Lubricants		
Fire Apparatus, etc			Miscel		
L'bty & Assay Tools & Supplies			Total		
Office Lights & Supplies			SPECIAL.		
Lights			New Construction		
Bdg & Bins, Fences			Improvements		
Miscel			Total		
POWER: Boilers, Pumps, etc			SUMMARY.		
Engines, Dynamos, Motors			Smelting Plant		
Blowers			Refinery		
Oils, Waste, Lubricants			Parting		
Miscel			Special		
Total			New Construction		
			Improvements		
			Grand Total		

Date ....

Superintendent.

It is now necessary to show how the contents of the various shipments from one department to another, refined products sold on the market, and stock on hand, show loss or gain in metals; also how the total receipts, of the entire plant show loss or gain on the total shipments and stock. It is necessary in the first instance to keep a systematic record of the shipments of the various departments, and of the refined metals. The shipments of by-products from one department to another are accounted for as if such shipments were an ore lot; and Settlement Sheet and Margin Tag is made out in the usual course. A separate record is required for the refined metals, and another for the by-products sent from department to department. Also in each department there is always a certain quantity of metal absorbed in the various furnaces, and some goes into the flues in the shape of flue-dust the absorptions of furnaces, vats, etc., and flue-dust accumulating must be estimated. There is no other way to include them, as it is impossible to tear down the furnaces, and clean out the flues at the end of each month. When a complete clean-up and cut-off is made, or when any furnace is torn down, adjustments are effected, and the excess, if any, is written off—the deficiency, if any, is written up. Such estimation is based on previous results, and if care is taken a very close approximation can be made. The metallurgical clerk, or assistant, keeps a strict record of the various shipments of refined metal as furnished him by the shipping clerk. The forms suitable for by-product shipments and refined metal are shown in Fig. 20, which would also be ruled to show production.

Special books may be kept for the refined products, or they may may be divided up in the one book, but compactness is always desirable, and is to be recommended. With the by-products, separate records may be kept for each department, which would be preferable where they run into considerable quantities. These records are intended for the plant only, and are not intended for the financial part of the work, though they serve as a check on the quantity sold and shipped, as shown by the accounts and records of the shipping clerk. The weight of the by-products sent to the departments would be taken from the Daily Operating Records sent in by the various foremen, who would also make out Weight & Assay slip to be passed on to the Laboratory for the balance of the details required.

The metallurgical balance is shown in Fig. 21. Where the gain for any one month is excessive, and there appears no reason for it, it is more than probably due to over-estimation of the furnace absorptions, and contents of flue-dust, etc., and in most cases some near-following

Fig. 28. PARTICULARS AND COST OF OPERATIONS.

For month ending .....

	Weight. Tons.	Labor.	Stores.	Total cost.	Cost per ton.
Ores sampled					
" crushed					
Matte "					
Ores roasted					
Matte "					
Briquetting					
Actual smelting					
Totals					

SMELTING RETURNS.

Smelted.	Net Weight. Tons.	Gold. Oz.	Silver. Oz.	Lead. Lb.	Copper. $ c.	Cost. $ c.
Ores: Direct						
Roasted						
Total ore						
Matte						
By-products						
Total ore, matte, by-products						
Limestone						
Ironstone						
Coke						
Total material smelted						

	Ore.	Matte.	By-products.	Limestone.	Iron.	Coke.
Average smelted per day ..... Tons						

Average Cost Per Ton Base Bullion Produced.	Total cost.	Cost per ton.
Wages		
Stores		
Limestone		
Iron		
Coke		
Coal (Base bullion produced ..... tons).		
Oil		
Salaries		
Interest		
Expenses		

Average cost per ton of ore smelted—including ore and matte roasted ..... tons $ .....

REFINING RETURNS.

Average Cost Per Ton Soft Lead Produced.	Total cost.	Cost per ton.
Wages		
Stores		
Zinc		
Coke		
Coal (Soft lead produced ..... tons).		
Oil		
Salaries		
Interest		
Expenses		

Average cost per ton ore —smelting and refining ..... $ .....

PARTING RETURNS.

Average Cost Per Ounce Fine Gold and Silver Produced.	Total cost.	Gold per oz.	Silver per oz.
Wages			
Stores			
Copper plates			
Coke			
Coal Fine gold produced ..... oz.			
Oil " silver " ..... oz.			
Salaries			
Interest			
Expenses			

Average cost per ton ore—smelting, refining, and parting ..... $ .....

Date .....

Superintendent.

month will show a corresponding loss. When, however, any complete clean-up is made the difference either way may be accepted as being almost the actual figures.

Having shown how the metallurgical balance is arrived at, it is now necessary to find out the cost of smelting, refining, and parting. To do this it is necesssary to go back to Fig. 1, the first report of the sampling foreman, and enter from there the Fuel & Fluxes (limestone, ironstone, coal, coke, oil, copper plates, sulphuric acid, zinc, etc.) received. Prices of such materials are obtained from the various accounts rendered. A special book is required for this, Fig. 22. At the end of each month the respective columns are totaled, and amounts used by the various departments, as shown on the various daily reports, deducted, such amount being charged to the department using the material. The quantity of fuel used by the boilers is proportioned over the plant, according to the number of horse-power hours used during the

Fig. 27. DISTRIBUTION OF LABOR.

For month ending .....

Item.	Cost of Labor.	Item.	Cost of Labor.
		PARTING.	
SAMPLING: Foremen.		POTS: Foremen	
Sampling		Labor	
Delivery to Bed		Repairs	
Repairs		Miscel	
Miscel		FURNACES: Foremen..	
ROASTERS: Foremen.		Labor	
Carmen & Weighers..		Repairs	
Roastermen		Miscel	
Repairs		TANKS: Foremen.....	
Miscel		Labor	
BRIQUETTING: Foremen		Repairs	
Wheelers & Weighers		Miscel	
Feeders		POWER (Proportion):	
Repairs		Engineers	
Miscel		Firemen	
CRUSHING: Foremen.		Repairs	
Ore Labor		Miscel	
Matte Labor		MACHINE SHOP)Proportion): Foremen	
Repairs		Labor	
Miscel		Repairs	
BLAST FURNACES: Foremen		Miscel	
Charge Wheelers & Weighers		FOUNDRY (Proportion): Foremen.....	
Feeders		Labor	
Tappers		Repairs	
Slag Labor & Hoisters		Miscel	
Furnace men		GENERAL: L'bty Helpers	
Matte Labor		Storekeeper	
Pump Labor		Watchmen	
Repairs		Repairs	
Miscel		Miscel	
POWER (Proportion):		Total	
Engineers		SPECIAL.	
Firemen		New Construction.....	
Repairs		Improvements	
Miscel		Total	
MACHINE SHOP (Proportion): Foremen		SUMMARY.	
Labor		Smelting Plant	
Repairs		Refinery	
Miscel		Parting	
FOUNDRY (Proportion): Foremen.....		Special	
Labor		New Construction.....	
Repairs		Improvements	
Miscel		Grand Total	
GENERAL (Proportion): Laboratory Helpers			
Storekeeper			
Watchmen			
Repairs			
Miscel			
Total			
REFINERY.			
BLAST FURNACE SWEATER: Foremen			
Labor			
Repairs			
Miscel			
SOFTENING FURNACES: Foremen .			
Labor			
Repairs			
Miscel			
DESILVERIZING KETTLE: Foremen			
Labor			
Repairs			
Miscel			
ANTIMONY FURNACE: Foremen ...			
Labor			
Repairs			
Miscel			
ZINC SWEATER: Foremen			
Labor			
Repairs			
Miscel			
RETORTS: Foremen ...			
Labor			
Repairs			
Miscel			
CUPELS: Foremen.....			
Labor			
Repairs			
Miscel			
MARKET LEAD KETTLES: Foremen			
Labor			
Repairs			
Miscel			
FOUNDRY & MACHINE SHOP: Foremen ...			
Labor			
Repairs			
Miscel			
GENERAL (Proportion): L'bty Helpers			
Storekeeper			
Watchmen			
Repairs			
Miscel			
Loading			
POWER (Proportion):			
Engineers			
Firemen			
Repairs			
Miscel			
Total			

Date ....

Superintendent.

month by each department. This information, of course, comes from the chief engineer, who fills in Fig. 23, at the end of each month. Where electricity is used, the same would apply. The next item to be considered is that of stores and supplies. It is the best in every way for the plant to have a storehouse, and storekeeper, who receives, checks, and is responsible for the goods placed under his care. Under no consideration should he deliver goods to anyone without a signed order from a foreman or responsible officer, and these orders should form the basis of his entries and charges to the various departments. Fig. 24 shows a form, simple yet effective, for this purpose. At the end of the month the storekeeper should total the value of stores charged to the varsous departments, and make out his monthly statement.

The monthly statement covers the whole of the accounts in his Store Ledger, which in turn covers those of the Financial Ledger. The simpler the form the less time is occupied in compiling it, but there is always more or less detail, so that the cost of the various operations can be arrived at if necessary. Fig. 25 shows a form that may be used, but if necessary it can be modified to suit any requirements. General items, such as fire apparatus, runways and tracks, laboratory tools and supplies, power, etc., are divided over the plant. When completed, this report, together with the sheets from his loose-leaf binder (assuming that he is working with the loose-leaf system, which is generally preferable) are sent to the office to be checked and passed. The next step is the time. The simplest way of keeping check on the time is by the Time Check Fig. 26.

Throwing the responsibility of putting in his own Time Check on each man, relieves the foreman and timekeeper of considerable work. If a man has been employed on half a dozen jobs during any one day, and in different departments, it should be itemized on the Time Check, and approved by the foreman of the gang to which he usually belongs. Being filled in by the man himself, there can be no claim for short pay when pay-day comes around. As with the storekeeper, the timekeeper would enter up his time in his Labor Distribution Book to the various departments from the Time Checks, from which he would also make up his Pay-Roll. The total of his Pay-Roll should check the total of his labor distribution; thus correctness of work is ensured. At the end of the month the columns are totaled, and the monthly report is made out, and sent in to the office for checking and approval. The monthly report would be itemized as with the Store Report, and the labor employed by the various departments would also be kept distinct. Fig. 27 shows a form that will answer this purpose.

General items, such as power-house labor, watchmen, etc., are apportioned as with the stores. Any cost for new construction or improvements cannot be charged direct to any particular department on the monthly statement, as it would swell the cost of treatment for the particular month in which it is incurred, out of all proportion to the actual cost of treatment for such month. It is only when such new construction or such improvements are in daily operation that their charge of operation and maintenance becomes a direct charge to the department to which they belong.

With the data now in hand, it is a simple matter to make up the cost per ton of ore smelted, the cost of treatment per ton of ore refined and parted; the cost of production per ton of lead, per ounce of doré bullion, and per ounce of fine gold and silver. The cost of sampling, roasting, briquetting, crushing, and handling matte, as well as the cost of fuel and fluxes used. Fig. 28 shows how this is made out.

In explanation of the foregoing statement it might be well to state briefly where the figures are taken from:

Ores Sampled..
- Weight from the Daily Operating Record.
- Labor from Timekeeper's Monthly Report.
- Stores from Storekeeper's Monthly Report.
- Total cost is the total of the two preceding columns.
- Cost per ton is the total cost divided by the weight.

Ores Crushed, Mattes Crushed, Ores and Mattes Roasted, Briquetting, and actual Smelting. Figures are taken from the same reports as Ores Sampled.

Ore Matte, and Bi-products smelted, with contents, are found on the Mixture Sheets.

Fuels and Fluxes used, are taken from the Fuel and Flux Record after it has been made up for the month.

In the cost per ton smelted, average cost per ton lead refined, and average cost per ounce of gold and silver parted, the wages and stores are taken from the Storekeeper's and Timekeeper's Monthly Reports. The proportion of salaries, interest, and general expenses are obtained from the cashier.

The statement of Particulars and Cost of Operations completes the Metallurgical Bookkeeping of the Plant. From now on the metallurgical becomes merged into the financial records of the concern, which, as already mentioned, do not need explanation here, as they embrace the usual phases of accountancy. With some plants it may be necessary to include other items on the various reports submitted; it may also be necessary to particularize and itemize the reports more, but throughout if the system as outlined, is followed systematically, methodically, with stringent exactness, it should meet every call on it, and each report will fit in its proper place, forming a harmonious whole, and when completed the reports present a compact, concise, and presentable statement of operations and cost.

[The first two parts of this article appear in the issues of November 10 and December 15.—Editor.]

Cornishmen in Evidence.

Our London correspondent has sent us an interesting photograph of one of the floats in the Lord Mayor's show. This annual event is a historical and industrial procession that parades the streets of the city of London on the day, each year, when the new Lord Mayor goes into office. This year the Mayor of London is a Cornishman, Sir William Treloar, and by his suggestion the pageant of November 11 included a car carrying a group of Cornish miners, who gave an exhibition of rock-drilling, as they progressed with the procession. The men were stalwart students from the Truro School of Mining, in charge of Capt. J. S. Henderson. The exhibit was a notable success.



Cousin Jacks in the Lord Mayor's Show.

THE ANEMOMETER of R. Goldschmidt, a Belgian electrician, depends upon variation in electrical resistance due to the cooling by the wind of an electrically heated platinum wire. To compensate for the changing temperature of the air itself two similar wires are used, and these form arms of a kind of wheatstone bridge, which is so adjusted that when the two wires are of equal resistance the galvanometer is at zero. After this adjustment, the cooling of the exposed wire—the other being protected—varies with the wind. The galvanometer—which may be at considerable distance away—is correspondingly deflected, and gives a direct reading of the wind's velocity, the indications having been accurately calibrated by driving one of the instruments on a rotating stand through calm air at a series of known speeds. With a recording galvanometer and an electrical weathercock—the latter acting through changes of contact on a circular slide wire—a permanent record can be kept of both the velocity and the direction of the wind.

MOST people are like the man who needs a jack-knife; if they want an opinion they borrow it.

The Right to Minerals on Railroad Lands.

Written for the MINING AND SCIENTIFIC PRESS
By COURTENAY DEKALB.

An agitation has been started in the State of Nevada to secure legislation permitting the valid location of mining claims on railroad grant lands by outside parties, under the plea that the right of eminent domain may apply in view of the fact that the chief interests of the State lie in its mineral wealth.

The question is one of importance to other States as well, and if Nevada can solve the problem by a statute which shall be held to be constitutional by the Supreme Court, a condition which has worked much hardship, and has retarded progress in many parts of the West, can be done away with.

The intent of Congress at the time of making land grants to the projected trans-continental railroads is perfectly plain from the express reservation of mineral lands from these grants. The alienation from the general public of large areas of mineral-producing territory was not contemplated, but the railroads took advantage of the provisions for having lands upon which valuable minerals had not been discovered, classified as agricultural lands by the Land Office, and proceeded to acquire title. This was accomplished perfunctorily for the most part, without investigation to establish the fact whether or not valuable minerals did exist on the lands for which titles were issued. It is true that surveys were made, but these disclosed nothing as to the character of the lands. It is also true that considerable areas remain unsurveyed where prospecting may be freely conducted, but such areas are mostly remote from the railroads, or else exceedingly inaccessible.

Formerly the railroads, in selling their lands, conveyed both surface and mineral rights, which went far toward mitigating the evils which have now become the object of complaint. At the present time it is the custom of the railroads to reserve the mineral rights, so that in effect the resources of important areas are completely locked up. It is difficult to see any legitimate interest which the railroads can have in the adoption of such a policy, since it deters settlers from buying land on account of the incompleteness of title, while on the other hand it is inconceivable that a corporation would risk the great expense of systematic prospecting and development necessary to prove the mineral values of its holdings. Prospecting is a function of a special class, willing to consume the earnings of a portion of each year in the quest of fortune during the remainder. Figured in terms of normal miners' wages and costs of supplies, the annual expenditure in the Western States in chasing the golden will-o'-the-wisp, can be counted only in millions of dollars. It used to be commonly asserted that the costs of prospecting plus unproductive mine development were twenty times greater than the net spot value of the total mineral output of the Western States. Though this may be an exaggeration, it would not be surprising to find that our production of metals was actually won at a loss.

If the railroads would adopt a broad policy, conceived in recognition of the fact that they exist by virtue of franchises granted by the State, virtually constituting them an arm of the Government for the promotion of the general welfare, and would grant prospecting privileges, retaining only the right to a suitable royalty on the output of mines which might be discovered, it is likely that such privileges would be eagerly sought, and that the system would meet with very general satisfaction. But the policy of the proverbial dog in the manger will continue to be offensive, and the public cannot forget that it was not intended to convey mineral rights to the railroads.

As the case now stands the prospector has no means of determining, without the very considerable initial expense of surveys, where the lines of the railroad sections lie in the great stretches of desert, for the survey monuments to a great extent have been obliterated. If he discovers a vein, he is permitted to work undisturbed until he has revealed something which affords promise of value, when proceedings to disposses him are instituted. After numerous experiences of this character, the prospector has become wary of districts in which every odd section belongs to the railroads, and consequently the land lies undeveloped, the public domain sharing in the evil because of the lack of adequate definition of metes and bounds by conspicuous marks.

It seems very doubtful whether, when titles have once been granted by the United States, the principle of eminent domain could be appealed to as a warrant for conceding the rights of location of mining claims to one set of legal persons in contravention of the rights of others acquired by patent, even though these be corporate persons. It is possible, however, that the principle might apply if the State assumed the right to grant claims in consideration of a royalty to be paid into the public treasury, if such right of location were made operative on all lands held in fee simple, without distinction of classes or persons. A precedent for this could be found in some of the Eastern States, the State of New York being a case in point, where the discoverer of veins of gold, silver, and certain other metals, is entitled to enter and operate the same, making an annual accounting to the original owner of the land, and paying him one-half of the net proceeds. But such privileges in the Eastern States are a relic of the colonial charters which affirmed the right of the crown to the monetary metals. Whether this ancient theory of sovereign prerogative could be extended to the newer States of the Union is a question for the legal fraternity to decide. If it could be done it would make strongly for the general good, not only of the public, but of the railroads themselves.

SCIENTIFIC INTEREST, with the possibility of great economic value, attaches to the discovery, by Dr. James Moir, of a new solvent for gold. It is thiocarbamide and is efficient in a slightly acid solution, a feature which renders it attractive to those that are treating old dumps or oxidized pyritic ores. The present price of the salt is high, but should there be a demand for it, new methods of manufacture are likely to be found.

QUICKSILVER IN TEXAS.—The greater part of the quicksilver produced in Texas has been obtained from shallow workings. That the easily accessible deposits should be utilized was natural; they were near the surface, rich, and cheaply mined. These surface deposits have not yet been exhausted, but companies now operating have commenced to exploit the ground in depth, anticipating the time when surface deposits can no longer be depended upon for regular supplies of surface ore. One company has already sunk its main shaft to 350 ft. with satisfactory results. According to present indications there is little doubt that ore may be profitably mined at as great a depth as 1,500 ft. in the limestones and 1,000 ft. in the shales, while so far as the shallow workings are concerned, it is held that there is much more quicksilver in the district to be obtained from this source than has been produced. The present mining laws are considered a detriment, the Commissioner of the General Land Office being vested with the power to fix his own valuation on a mining claim over and above a minimum of $25 per acre.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

Certain amendments to the statutes of Nevada were enacted for the benefit of locators of mining claims, giving them ninety days in which to perfect their location, to cure defects, if any existed, in the original notice or the marking of the boundaries, mistakes in the directions, courses, etc. But the statute does not require the filing of an amended certificate of location where the original notice is clear, definite, and certain, and the boundaries of the claim so marked and monumented that they can be readily traced, in which case such notice may be filed and recorded as a certificate of location. The reason for this is that mining claims are not open to re-location until the rights of a former locator have come to an end, as two locators cannot legally occupy the same place at the same time. However regular in form a junior location might be, it is of no effect as against the rights conferred upon the prior locator, so long as the prior location is subsisting.

Porter *v.* Tonopah North Star Tunnel &c. Co., 133 Fed. 756.

In a case where the principal controverted question related to the sufficiency of the mineral discovery claimed to have been made by the locators to sustain their placer location, the trial court stated the law to the jury thus: "What is a 'discovery?' What finding of mineral upon a placer mining claim is sufficient to satisfy that clause of the statute which provides that no location of a mining claim shall be made until the 'discovery' of the mineral within the limits of the claims are located? This inquiry is partly answered by the terms of section 2,318 of the Revised Statutes of the United States, in the following language: 'In all cases lands valuable for mineral shall be reserved from sale, except as expressly directed below.' It is only lands valuable for mineral which are reserved from sale for disposal under the mineral laws. Lands not valuable for mineral are not so reserved, and may, if otherwise unappropriated and unoccupied, be settled upon and used, and occupied for townsite or business purposes, or taken under the homestead or other laws for the settlement and sale of the public domain. Lands valuable for mineral are lands having value or worth for the minerals contained therein; lands containing mineral in such quantity as to pay a reasonable profit upon the capital and labor necessary to extract the mineral therefrom. Any other lands would have no value for mineral, and are not such as the statute contemplate reserving from sale for disposal under the mineral laws of the United States."

In this instruction the Court stated the correct rule that it was essential to the validity of the location under which the claim was made that the discovery of mineral thereon was such that "an ordinarily prudent man, not necessarily a miner, would be justified in expending his time and labor thereon in the development of the property." But at the same time the Court further instructed the jury that it was essential to the recovery by the claimants that "they should have proved with reasonable clearness that for the labor and capital expended in locating the ground it would yield a reasonable profit, and that, unless the jury so found, their verdict should be for the defendant." On appeal, the Court held that this latter instruction was not only not a correct statement of the law, but was also in conflict with the correct rule given.

Cascaden *v.* Bartolis, 146 Fed. 739.

Where a miner was engaged under a contract at a specified rate per ton for ore delivered at the mouth of the shaft, and under the contract it was his duty to run his loaded cars out of the room in which he worked to the entry and in so doing a car was derailed. The responsibility of getting the car back on the track rested upon such miner, and the proprietor of the mine was chargable with no duty to a person injured in assisting the miner in the re-railing of such derailed car.

Cavanaugh *v.* Centerville &c., Co. 109 N. W. 303.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The two minerals from C. W., of Daunt, Cal., are: No. 1, brown Jasper; No. 2, earthy Limonite.

W. W. J., of Elmore county, Idaho: The large specimen is Chalcedony, and the small one opalized wood.

The rocks from Wallace, Idaho, are: No. 1 and 2, Slate; No. 3, decomposed clay rock; No. 4, Quartzite.

Specimens from F. A. F., of Tehachapi, Cal., are: No. 1, Andesite; No. 2, Quartz stained with oxides of iron and manganese; No. 3, Authophyllite, or a brown amphibole altering to talc.

The mineral sent by H. J. C. W., of Bruce Mines, Ont., is Bornite, but it probably contains an admixture of chalcocite, which raises the percentage of copper. Some chalcopyrite is also present.

The rocks from W. H. L., of Cobalt, Ont., are: No. 1, 2, 3, and 4, metamorphosed and mineralized rock, perhaps altered; No. 5 is a Diorite. The rocks are too fine-grained to definitely class them without a microscopical examination.

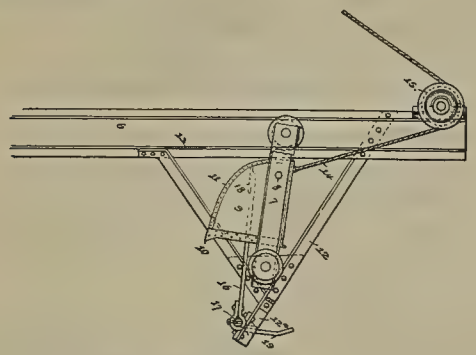
IT is beginning to be recognized that industrial warfare is no better a regulator of business than private warfare is of social intercourse, and it is this feeling that has led to the organization of labor on the one hand and to the organization of capital on the other, labor seeking to reduce its hours and increase its earnings, and capital, which is crystallized labor, striving to prevent the dissipation of that which it has so laboriously gathered. Each is wrong in its aims when it seeks exclusive domination, both will be right when they learn that they are forces which must work in harmony to carry out the ancient command to subdue and replenish the earth. Strikes and trusts are the clumsy attempts of the giants, Labor and Capital, to carve out each a world on which he shall be sole lord. Co-operation will be the form in which they will work together when they realize, as they are coming to do, that as enemies they can only harm each other while as allies they are masters of the world.

POWER prices vary widely. As a rule, power from hydraulic installations is cheapest, and power developed from coal that must bear the expense of a long railroad haul is the dearest. According to a recent report by the Hydro-Electric Power Commission appointed by the Ontario Government, $12 per horse-power year may be assumed as the cost of developing high-tension power at Niagara Falls. Transformed into low-tension power and delivered to sub-stations throughout the province, the cost would be from $15 to $35, varying with the amount, distance and load. The cost of distribution from the sub-stations to the individual consumers would vary from $2.51 to $24.74 her h.p. year, according to the amount and the distance. The annual cost of twenty-four-hour steam plant power per brake horse-power, with $4 bituminous coal, according to the same report, would vary, with the character of the plant and the amount of power developed from $41.11 to $180.76. Under the same conditions, it is estimated in this report that producer gas power would vary in cost from $34.66 to $90.02. For ten-hour power, developed from producer gas, the cost would vary from $20.46 to $53.48; for steam power from $22.47 to $91.16.

MINING AND METALLURGICAL PATENTS.

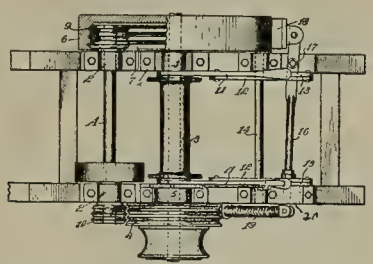
Specially reported for the MINING AND SCIENTIFIC PRESS.

CLEANER FOR BUCKETS OF EXCAVATING MACHINES.—No. 833,749; Howard Pike, Chicago, Ill., assignor to F. C. Austin, Drainage Excavator Company, Chicago, Illinois.



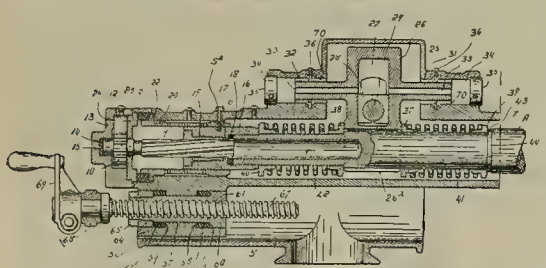
The combination with an excavator-bucket and means for effecting the inversion thereof, of a cleaner pivotally mounted externally of said bucket, said cleaner having an operating edge adapted to engage the forward edge of the bottom wall of the bucket and scrape over said bottom wall during the inverting of the bucket, substantially as described.

HOISTING APPARATUS.—No. 833,994; William S. Bradshaw, San Jose, California.



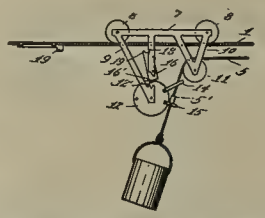
In hoisting apparatus, the combination of a drum having a plurality of frictional surfaces, a drive-shaft having a plurality of frictional surfaces, and means for shifting the drum relative to the shaft whereby one of the frictional surfaces thereof will engage one of the frictional surfaces of the drive-shaft and the other frictional surface of the drum will simultaneously disengage the like surface of the shaft.

ROCK-DRILL.—No. 833,875; Henry Deitz, Denver, Colo., assignor to Anna Theresa Deitz, Denver, Colorado.



In a rock-drill, the combination with a guide-shell, casing, and reciprocating yoke, of a drill-holder mounted in the casing collars loosely mounted on the holder and engaged by the yoke which is located between them, springs surrounding the drill-holder and engaging the yoke-collars, other collars surrounding the drill-holder and engaging the spring extremities remote from the yoke, the foremost collar and the rear yoke-collar engaging shoulders on the drill-holder, the collars being in the rear of the shoulders and the portion of the drill-holder immediately forward of each shoulder being reduced for the purpose set forth.

ELEVATED CONVEYOR.—No. 834,194; John W. Cooper, Seattle, Washington.



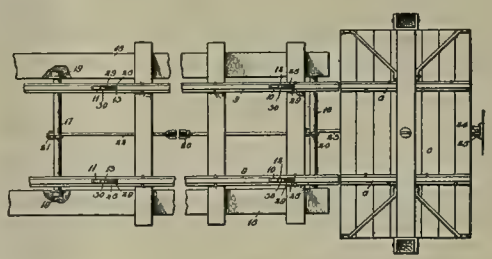
In combination with a track and a stop thereon, a carriage on said track, a hoisting-rope supported on the carriage and provided with an enlargement, a rotatable element on the carriage having a depression in its edge portion and provided with a projection receiving said rope and being adapted to be engaged by the enlargement thereof to effect rotation of said element, means secured to the edge portion of said element at a point below the projection thereof and embracing the rope after said element has been rotated, and a catch member pivoted to the carriage and having its lower portion formed to snugly engage the edge portion of said element or engage in the depression thereof and having its upper portion formed for locking engagement with said stop.

REMOVABLE POINT FOR PICKS.—No. 836,856; Cyrille Bourque, Vancouver, British Columbia, Canada.



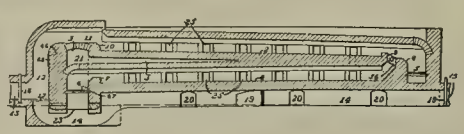
As an attachment for picks, a removable point provided with a tapered socket, the corners of which socket are curved, said socket being adapted to receive a similarly tapered end of the head of a pick and be self-holding thereon, substantially as shown and described.

MINE-CAR STOP—No. 836,880; John Hamilton, Byesville, Ohio.



The combination with a cage in a shaft and a track leading thereto, of fore and rear carstops connected together and movable oppositely up and down through the track, to stop and release the first and successive cars respectively, a tripper in the shaft arranged to be struck by the cage, and operative connections located under the track and extending between the tripper and the stops, to raise and lower the latter.

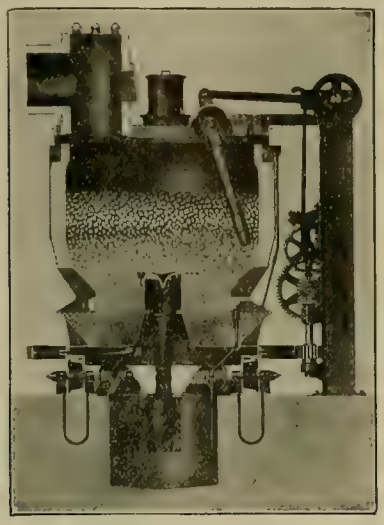
MECHANICALLY RABBLED ORE-ROASTING FURNACE.—No. 836,871; Thomas Edwards, Sebastopol, Ballarat, Victoria, Australia.



In an ore-roasting furnace, in combination with superimposed hearths, multiple rabbles, a plurality of lines of rabble-spindle-rotating overhead shafting, and a plurality of longitudinal series of superimposed closable apertures for insertion and removable of multiple rabbles as indicated.

The Hughes Gas Producer.

The accompanying illustration gives a sectional view of the Hughes mechanically poked continuous gas producer, which is manufactured exclusively by The Wellman-Seaver-Morgan Co. at Cleveland, Ohio. The special feature is the mechanical poker, which is a water-cooled steel casing, suspended from a trunnion. The poker is operated by ratchet gearing actuated by a crank and crank-shaft, which in turn are driven by a reduction of gearing connected with the main shaft. This mechanism moves the poker back and forth in the coal, agitating and breaking up the mass of coal, and also assisting in the distribution of the coal and the working down of the ashes for removal. Thus hand labor in poking is eliminated, and the fuel is not subjected to the variations in treatment incidental to hand poking. This uniform treatment has proved especially beneficial, giving better and more uniform results as to quality, quantity, and supply of gas, and thus reducing the number of producer units and the size or number of buildings required for a given capacity. Under average conditions it is stated that the capacity of the mechanically poked producer will average 25 lb. per hour per sq. ft. of producer area, and that frequently 30 lb. per sq. ft. may be gasified for long intervals. The nominal capacity for the Hughes gas producer is one ton of coal per hour per producer, basing this estimate upon the standard size of producer, which is 10 ft. diam. inside of the fire-brick lining.



Sectional View of Hughes Patent Mechanically Poked Continuous Gas Producer.

The main shaft and gearing are supported by steel framework securely braced to the top of the producer. The gearing is accessibly placed for removal or repairs. The producer shell is of steel plate, and is secured to a cast-iron base ring, to which is bolted a cast-iron water-seal forming an ash receptacle. The base ring rests upon supporting columns bolted to a cast-iron revolving turntable, which as it turns rotates with it the body of the producer and the ash-pan.

The bottom of the turntable is fitted with a steel tread resting on conical carrying wheels and supported by the necessary axles and boxes. As the producer shell revolves, the ashes work down and are deposited in the rotating water sealed ash pan, from which they may be shoveled direct to the car by a man standing at one side of producer, and without the intervention of machinery. The producer shell is arranged for the usual fire-brick lining. The producer top is a steel casting flanged and ribbed to provide for water cooling, a water seal being formed by a top flange at the outer circumference of the producer cover. The use of a steel casting for the producer top adds materially to its durability, as experience has demonstrated that, where parts are exposed to the heat, steel castings are much superior to cast iron and decrease the expense for repairs.

These producers are driven by electric motors, either alternating current or direct current, as desired. The power required to operate a single machine continually is three electric horsepower. The labor required is, of course, somewhat dependent upon the arrangement of the plant and the facilities for coal and ash handling. In plants where the coal is delivered overhead into bins and fed to the producer by a hopper or other mechanical devices, six men are ordinarily sufficient to operate eight producers, or an average of three-fourths of a man per producer per turn.

An Improved Derrick Engine.

The system of hoisting with derricks passed through many stages of improvement until it reached its present state. The tag line for pulling the boom around has always been expensive and slow. Some contractors got up schemes of their own and men of inventive genius came to their aid to devise means to swing the boom with the hoisting engine. The simplest and most efficient is claimed to be the Werner & Flory patent. It supplies a long-felt need for the successful and economical operation of boom derricks. It is extremely simple and efficient. The accompanying engraving shows the arrangement of the gears and drums to swing the boom in either direction. It is independent in action from the hoisting drums, and at will the engineer can swing the boom while hoisting or lowering the load, or when the hoisting drums stand still.

It consists of a series of gears which are placed in a cast-iron frame connecting the front drum-shaft and swinging shaft. The drum-shaft projects beyond the housing sufficiently to receive a pinion-frame and winch-head. Two of the swinging gears are fitted with the Flory standard type of friction, with special compensation for adjustment. It is through these gears that the swinging drums are reversed. The entire equipment is mounted on skids so the gears clear the ground or floor on barges or docks.

The movements are effected by a single lever placed in notched quadrants between the two friction drum-levers, convenient for the engineer. The illustration does not show this part properly. Placing the lever in a vertical position, both swinging drums are out of frictional contact, and stand still; moving it forward, the drums revolve in one direction, and are reversed by moving it back over the centre. The sluing rope, of course, gives and takes, but it is always taut without the use of brake-bands. For further information the reader is referred to the S. Flory Manufacturing Co., at Bangor, Pennsylvania.

Trade Treatises.

THE BRODERICK & BASCOM ROPE CO. of St. Louis, Mo., is sending out a handsome blotter, bound in a celluloid cover, on which is a view of an aerial tramway 3½ miles long, erected by this company in South America. This blotter will be sent on request.

Publications Received.

UNITED STATES GEOLOGICAL SURVEY. The Production of Platinum, by F. W. Horton; The Production of Bauxite and Aluminum; Contributions to Economic Geology.

THE FIRST ANNUAL CONVENTION of the Sigma Rho Fraternity, of the Michigan College of Mines, will be held at Chicago and Milwaukee on Thursday, Friday, and Saturday, January 3, 4, and 5, 1907. An important feature of the convention will be the formation of the alumnus body of the fraternity into the Alumnus Association. Various plants and works, which appertain to mines, mining, and the manufacture of mining machinery, will be visited by the convention during its three days' session. The Committee on Convention hopes to secure as large an attendance as is possible in order that the Alumnus Association may outline a future policy for expansion and growth, which will meet with general approbation, and which will be followed by success. The Committee has arranged a program, which will prove entertaining, instructive, and profitable, and has also secured privileges for the delegates which individually they would be denied.

Commercial Paragraphs.

WORD BROS., of San Francisco, have issued a handsome little circular describing their well-known drill-maker and sharpener.

JOHN H. MARKS and E. S. SNELL have opened offices at 503-4-5 Empire Bdg., Denver, and will do a general engineering business.

W. L. LOVELAND, manager of the mining-machinery department of the Allis-Chalmers Co., has returned to Milwaukee from Denver.

C. I. GLASSBROOK has been appointed local manager of the Mine & Smelter Supply Co., with offices at 9 Front St., San Francisco, California.

THE H. W. JOHNS-MANVILLE Co., of New York, announces that its Boston branch will move early in December into a new building at No. 55–59 High Street.

W. J. Spencer, special representative of the REVERE RUBBER Co. in the Western States, with headquarters at Denver with the Mine & Smelter Supply Co., is at the factory, in Boston.

THE WESTERN ELECTRIC Co., of Chicago, have issued a handsome booklet describing their new plant at Hawthorne, where they are now able to build heavy power apparatus and switchboards.

STONE & BROWN, of Searchlight, Nevada, have just issued a new and complete map of the Searchlight mining district. All the wagon-roads are shown and the surveyed claims are platted from field notes.

THE DE LA VERGNE MACHINE Co., on East 138th St., New York, has just issued a folder describing the Klein water-cooling tower built by them. These towers will cool the water to from 5 to 15° below the temperature of the atmosphere.

THE JOSEPH DIXON CRUCIBLE Co., of Jersey City, N. J., publishes a neat pamphlet containing illustrated essays upon 'The Function and Value of Flake Graphite' in air-compressor lubrication, from the theoretical as well as the practical standpoint.

Through G. & O. Braniff & Co., agents for the WESTINGHOUSE ELECTRIC & MFG. Co., Pittsburg, Pa., a large and modern electrical plant for lighting and power is being installed by the Oaxaca Smelting & Refining Co., of which O. F. Westlund is manager.

J. W. DUNTLEY, president of the Chicago Pneumatic Tool Co., sailed for Europe on November 6, for a five weeks' trip in the interest of the company's business, during which time he will visit the important trades generally in England, Scotland, France, and Germany.

THE SULLIVAN MACHINERY Co. announces the opening of a branch office and warehouse at 319 Howard St., San Francisco, Cal. The best obtainable facilities have been provided for the prompt handling of business. Howard T. Walsh will be manager of this branch.

THE POWER & MINING MACHINERY Co., of Cudahy, Wis., has issued a handsomely illustrated catalogue (No. 6) descriptive of standard machinery, furnaces, and equipment used in roasting, smelting, and refining. The designs embody improvements in mine machinery introduced by this firm.

AUGUST MIETZ IRON FOUNDRY & MACHINE WORKS, of New York, issue catalogue M5 and A42 describing their marine oil engines and gas engines, as adopted by the United States and foreign Governments. These machines have been in wide use for the last ten years and they have undergone recent improvements, making them even more simple and effective.

As an indication of the prosperity of the country the BUSINESS MEN'S CLEARING HOUSE at Denver states that of the many orders it receives from concerns from different parts of the world for accountants, stenographers, engineers, and technical men, it is only able to supply about one-half the demand. During the past year or two this company has more than doubled its capacity for handling this class of trade, and is now obliged to add another room to its already commodious office. This institution is divided into five departments: Mining, Engineering, Accounting, Stenographic, and Mercantile, and it is prepared to secure positions for first-class men in any part of the country.

THE KEYSTONE DRILLER Co. has opened offices at 170 Broadway, in New York, as an Eastern Sales & Export office. This move has been necessitated partly by the remarkable growth of their sales of Portable Well Drilling Machines in South Africa, South America, and Russia, and also by the increase in the volume of business coming to them directly from the City of New York.

The Cieneguita Copper Co., whose mines are at Tarochi, Sonora, Mexico, has ordered of the TRAYLOR ENGINEERING Co., of New York, a reverberatory furnace, a set of crushing rolls, a Blake rock and ore crusher, and a Centripact screen. The crushing rolls and the Blake crusher are sectionalized for mule-back transportation, and other machinery is so designed that no single part shall be too heavy for transportation.

THE ATLAS ENGINE WORKS, of Indianapolis, Ind., has sold through its agency at Mackinac Island, Michigan, three large high-pressure Atlas water-tube boilers, to be installed in the new stamp-mill of the Michigan Copper Mining Co., at Keweenaw Bay, in the northern peninsula of Michigan. These boilers are for 200-lb. working pressure, they will superheat their own steam, without using a superheater, and are guaranteed to develop from 10 to 30° superheat, with the proper quality of coal and good firing.

PRICES in the electrical trade continue to show a distinct upward tendency in sympathy with the well-maintained advance which has taken place in the prices of all raw materials. Orders for future delivery can only be placed in many instances at a considerable advance over present market quotations. The GENERAL ELECTRIC COMPANY, in common with many other large manufacturing concerns, is announcing a general advance in prices of electrical apparatus and supplies. This will not unlikely be followed by further advances, if present market conditions continue.

Books Received.

PROBLEMS IN SURVEYING, Railroad Surveying, and Geodesy, by Howard Chapin Ives and Harold Ezra Hilts, both instructors in the University of Pennsylvania. It is a manual to be used in field courses of study. Published by John Wiley & Sons. Price $1.50.

PETROLEUM AND ITS PRODUCTS, by Sir Boverton Redwood, deals with the whole subject of petroleum, its geographical distribution, and geological occurrence, also the physical and chemical properties of petroleum and ozokerite, together with a full description of natural gas, shale oil, and allied industries. Published by J. B. Lippincott Co., Philadelphia, Pa.; 2 Vol., price $13.50.

THE STEEL SQUARE AS A CALCULATING MACHINE.—This little book describes in simple language a number of difficult problems in all branches of mechanics that may be solved by the aid of the common steel square without any calculation whatever. The explanations are full and clear, so that they are easily understood and put into practice. Published by the Industrial Publication Co., New York. Price 50 cents.

'Industrial Furnaces and Methods of Control,' will be welcomed by the managers of furnaces. There is a poverty of English literature on this important subject, which renders this admirable translation of Emilio Damour's work, by A. L. J. Queneau, the more welcome and valuable. It gives the results of many scientific experiments, as well as of practical experience. The value of the book is greatly increased by the numerous halftones, line drawings, and diagrammatic plates which accompany it. There are 21 chapters in the volume, each devoted to a particular branch of the broad subject, passing from one phase to another in rational succession. It deals with heat, and its generation; utilization of heat; types of furnaces; fuels, their analyses and efficiency; chimneys, and numerous useful tables. This valuable book will be sent by the MINING AND SCIENTIFIC PRESS upon receipt of price, $4, postpaid. *The Engineering & Mining Journal*, Publishers, 505 Pearl St., New York.

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Editorial.

ON ANOTHER PAGE Mr. John A. Reid makes a plea for the preservation of place names, such as embody the history of the country. In California particularly, where the Spanish names carry forward the traditions of an era now fast receding into the historic background, it is well to retain intact the old nomenclature.

EVERYONE KNOWS that Mr. Albert Ladd Colby possesses a vast amount of useful information, especially on nickel steel, but we were not prepared for the statement that his "search through the proceedings of scientific societies for the past eighty years" showed that someone was a little severe in his criticism. If Mr. Colby has been delving into the reference library of the profession for eighty years he must be a sage indeed, and we hope he will hasten to write his autobiography before it is too late—*absit omen.* All of which is merely intended to draw attention to the value of punctuation.

THE GEOLOGICAL SURVEY OF CANADA is being bothered by enquiries regarding the advisability of investing in the Amalgamated Coal Company of British Columbia, and while it cannot give such advice, it refers to the reports of Mr. R. W. Ells on the Nicola and Quilchena coal basins. It appears that the 17,000 acres of the alleged coal company are all situated in volcanic rocks, and that the claim to a large tonnage of valuable coal is without basis of fact.

IN THIS ISSUE we publish an article on the legendary mines of the desert region by Mr. W. H. Storms. The article is written in his best vein and is full of interest, together with a dash of humor—a most excellent seasoning. These legendary mines have caused loss of life and money in the fruitless search for fabulous veins of gold, but they have not been an unmixed evil, for the lure of them—like that of the fabled El Dorado, the Hesperides, and Ophir—has drawn strong energetic men into exploration of untraversed tracts of desert country and, in a way, prepared the way for the present blossoming of southwestern Nevada. 'Lost mines' are making their appearance in prospectuses and it is a wonder that they have not been used more by the predatory financier, for it is a fact that humankind has ever been fascinated by the picture of lost treasure, sunken galleons, and buried gold. The year now closing has seen the equipment of an expedition to find the loot of a pirate's nest, as disclosed by a chart made by a prisoner who escaped. But even in this there is, to a modern mind, less of fascination than in the story of a wandering prospector that loses his way, and dying of thirst, sees the fierce sun set behind forbidding ridges, alone in an aching desolation; then the slanting sunbeams strike an outcrop of quartz and as the light suffuses the white rock, he

sees that it is ribbed with gold. He breaks off some pieces, his courage is restored, he faces the unknown once more, and emerges at last—the wreck of a man—on the outskirts of civilzation. He has been compelled to drop his specimens of golden quartz, for they were too heavy, so there is only his story and his privations to offer as evidence. And so forth. But truth is stranger than fiction, and the facts that appertain to the discoveries of mines in the Great West will put to shame the most lurid imagining of the literary artist. For example, the authentic tale—for is it not recorded in the chronicles of the U. S. Geological Survey—of the men whom Tabor grub-staked, who took with them a bottle of whisky—to be used medicinally—and having started up the hills behind Leadville, decided that the moment was propitious for the emptying of that bottle—so that they might not be burdened with the unnecessary weight of it. Having imbibed generously, it occured to them that there, on the spot where they rested, was the place to dig a hole, for it looked a likely place for mineral—to a fuddled head. They dug and they struck it; it happened to be one of the few places where the Leadville ore measures came near grass roots; their haphazard hole became the Little Pittsburg mine. The moral being, not that you must use whisky in prospecting, but that you must dig.

Air Blasts.

On another page we give a part of Mr. C. R. Corning's scholarly translation of a most interesting paper on the cause of air blasts in the famous mines of Pribram, in Bohemia. Similar phenomena have been observed in India, in New South Wales, and in Michigan, although the conditions have differed in each locality. Chemical processes have been referred to in explaining this sudden rupturing of rock underground, and the analogy of the so-called Prince Rupert's drops—made by sudden cooling of drops of molten glass—has been used to illustrate the state of molecular strain, the sudden relief of which is supposed to cause the explosive shattering of the rock. But these theories have been largely put to one side as careful observations have been gathered in different parts of the world. At Pribram the explanation given is in accord with the generally accepted view that air blasts are traceable to unequal stresses caused by strata that are in a region undergoing pressure, and that the immediate cause is the disturbance of an unstable equilibrium by mining operations. In these celebrated mines the pressure of the overlying rock-mass is one factor, but a distinct stress parallel to the bedding planes of a synclinal fold, is another. Despite precautions, several men have been killed and now it is the custom in dangerous ground to use shields, made of planks firmly spiked together. It may be described as the intrusion of man into a geological position of extreme delicacy. The sudden shattering of the sandstone at Pribram into a number of fragments, with a noise as of a powder explosion, is duplicated at Hillgrove, in New South Wales, where there is a particular belt of silicified slate known as the 'kicking zone.' This slate is traversed by numerous joints, coated with films of calcite. When tapped with a hammer the rock breaks suddenly into fragments. Where an arch of ground is left standing in the stopes, it is apt to exhibit extreme strain, pieces flying off with projectile violence and sometimes the whole mass explodes, with the noise of breaking crockery, so as to cause fatal accidents. But these occurrences do not happen in cross-cuts or in shafts, only in drifts that follow the gold vein, suggesting that it is the extra pressure consequent upon underground excavations that is the final factor in causing the rupture of the rock. In the gold mines of the Mysore, in India, the rock has been known to 'fly' and in this case the explosive shattering is not confined to one kind of rock; it has been noted not only in the hornblende schist and in trap dikes, but in the quartz veins that they enclose. It is stated that there is a well-marked jointing, suggestive of extreme pressure. In this instance also, it is conceded that the air blasts in the lode may be due to pressure of the walls following the removal of ore. Such undoubtedly is the case in the copper mines of the Lake Superior region. There air blasts have attained the dignity of 'earthquakes' and when several of them occurred last April, the daily papers gave them a kinship with the jar that so seriously disturbed San Francisco. But this, of course, was an error. The big copper mines that are most affected by air blasts have been stoped almost continuously in strike and dip for several thousand feet, and, the lodes dipping rather flatly, there is a great superincumbent mass of rock, the pressure of which increases as the mines are deepened. When the strain is too much for the pillars and arches left standing in the stopes, there is a sudden crushing of the rock, a collapse of the hanging wall, and the violent expulsion of a large volume of air, with reverberations and vibrations that extend throughout the mine and to the surface, where the houses and those that inhabit them go through an experience not unlike that of a small earthquake shock. In these lodes, with a dip of 37 to 50 degrees, there is a big overhang, a width of 8 to 20 feet of ore being stoped continuously, save for occasional pillars, until the pressure becomes excessive. If the ground would yield easily, or if soft headboards were used with the stulls so as to take up the pressure gradually, the suddenness—and with it the violence—of this settling of the ground would be decreased. The Quincy and the Atlantic mines are famous for their air blasts. The former has 62 levels, reaching to a depth of over a mile on the dip, with almost continuous stopes 3 to 20 feet wide, and almost as long as they are deep; the latter has been stoped for a uniform width of 15 feet to a depth of nearly 3,000 feet on a dip of 54° and for a length of over 4,000 feet. Successive air blasts in the early part of this year finally compelled the abandonment of mining at the Atlantic, the extra cost of repairs being too much for the small profit won from a lode that averaged less than one per cent native copper. Thus, in every case, we find that mechanical causes explain these mysterious rock explosions and that while nature is primarily responsible for the condition of unstable equilibrium, the immediate agent is man, who interferes with forces that are beyond his control.

By the Way.

In a recent address on 'The Technical School and the University,' Mr. William H. Burr, professor of civil engineering in Columbia University, said:

So closely are all forms of knowledge related in their fundamental elements that no one of them can attain to a state of real growth without carrying others with it. This elementary principle, which finds illustrations and the most conclusive proof in every field of educational experience, underlies the fundamental organization of the university, and it completely justifies the place of the technical school in the university plan.

The ramifications of every branch of science reach a great variety of human interests, many of which are directly affected by it, while others are more remotely touched. The full significance of every acquisition of knowledge can only be understood or even to a small degree appreciated by realizing the industrial activities or other real interests of the community which it affects. An isolated study of any one technical subject, or of any other subject, without regard to its relation to other branches of knowledge, would be excessively narrow in its results and probably as valueless as narrow, if indeed such a study be not unthinkable. The greater the number and scope of scientific or technical subjects brought within the range of instruction, the broader will be the whole amount of knowledge acquired, and the more complete and thorough will be the comprehension of any one of them. There is a limit to the number of subjects which can profitably be taken by any student in a course of proposed study, but there can be no question whatever that the instruction in any one subject will be enhanced in value in proportion to its breadth, or its reach into other and related or affiliated subjects.

The more complete the view of the field covered, the more satisfactory will be the student's work in it. In fact, it may be stated that the real study of any one part of the field of knowledge consists in acquiring information relating to its effect upon other fields into which it reaches. It is impossible to conceive of any subject of scientific study as an abstraction either from other subjects or from the material elements of experience.

The advantages gained by a technical school in a university environment are fundamental; they touch both its technical work and the general educational training which must precede the technical in any adequate course of study of a professional character. An engineering or other technical student pursuing his work in a university system finds himself in a stimulating atmosphere of study and investigation reaching far beyond the limits of his own field. He acquires largely by incidental or even unconscious absorption a broad cultivation by constant contact with active educational work, some of which is more or less affiliated with his and some not. This association is an inspiration to a broader and more enthusiastic view of his own work in itself as well as a material enhancement of value of that work by disclosing its relations to other fields of learning, all impossible to attain outside of the university. These conditions give his educational training qualities that not only strengthen them and widen his subsequent professional practice, but contribute most effectively to his intelligence and usefulness as an educated citizen.

More than this, the technical professions now demand of their members for the higher planes of successful practice the same general educational preparation for professional study as that required by the best law and medical schools. Without entering into a discussion as to the relative merits of the educational work done by the small college and by that forming a subordinate member of the university, it is sufficient to say that this part of a well-rounded course of professional study harmonizes completely with the university system, and is in fact an essential element of it.

The university has long since lost the character, if it ever properly had it, of a place where abstractions of learning, separated from the things which only give them life, are to be dispensed after the manner of instruction to men who are never to deal with the affairs of life. It has come to be an intensely practical working agent. It is effective and worthy of support only in so far as it makes itself felt in the real life of the community. If it is to be a true and real centre of instruction it is imperative that it shall carry knowledge into every useful calling, governmental, corporate, or private. The time will soon come, if indeed it is not already reached, when it only can prepare men to administer and extend in a rational and moral way the great industrial activities which at the present time form the foundation of the material prosperity of the modern world.

The true student of the professional or technical school becomes heir to a comprehensive and clear understanding of his duties and responsibilities in his relations to his fellow men and to the community. Those duties and responsibilities present themselves to his trained mind in their real proportion. He is neither non-developed nor mal-developed in his judgment of affairs. His university training, especially in the technical school, has taught him accuracy and penetration in the analysis of any proposition confronting him, and that truth and knowledge must be sought with the directness of a plumb line. Science yields nothing but confusion to the shifty, devious, and dishonest inquirer. The fundamentals of morality are the very stepping stones to technical success or professional attainment.

The opportunities offered in the administration of public affairs and the great corporate interests of the present time, rapidly increasing in number and magnitude, create almost irresistible temptations to prostitute them to selfish gain. The realization that great power, or what has now come to be its full equivalent, great wealth, is a grave and delicate trust, to which selfish gratification in its infinite and seductive variety is abhorrent, comes most naturally and easily through sound knowledge 'the beginning of wisdom.'

The correct conception of his duties gives to the professional man such a deep and true sense of his responsibilities as to render him the safest administrator of those great interests whose sinister power has already threatened both the morals and the safety of the community. Selfish gratification is a temptation to which he may or may not yield, but his inheritance from the university translates wealth to be a means of accomplishing the highest means of life, and saves him from that narrow, common complaisancy of wealth which is the dry rot of character.

In this age of self-appointed erratic and dangerous regulators of society when an unreasoning and destructive discontent frequently prompts to crude measures whose real purpose is a blind upheaval of the existing order of things, the intelligence and the calm balance of the university man of affairs must be the corner stones of public safety. His trained mind taught to analyze and to test by the records of experience no less than by the precepts of science does not lose its poise before either the shallow plausibilities of the advocate of Utopia or the sinister deceptions of the revolutionary reformer or what has come to be nearly as bad, by the egoistic and blundering, although much-applauded strenuosity of the present time. It is not to be supposed for a moment that every subject of university training will issue from its halls the ideal well-rounded citizen, but judgment must be passed upon such matters in view of their resultant tendencies.

Special Correspondence.

London.

Cornish Mining.— More Flotations.— Irish Copper Mining.— Local Enthusiasm and a Banquet.— San Francisco del Oro.— Stratton's Independence.—Treatment of Low-Grade Ores.

The Cornish mining industry is described by a well-wisher as steadily progressive. One would like to see more proof of it at the tin 'ticketings,' as a variation in the list of the ten or a dozen old familiar names that crop up at every fortnightly sale for about the same tonnage more or less. We are promised that it is really "hoped to offer" a first parcel of black tin from South Crofty next week. Progress is still marked by the writing up of old mines for flotation. The Tresavean mine, in the once famous district of Gwennap, is being taken in hand, it is said, by a new company. The late Capt. Thomas Teague, at an outlay of about £1,000, succeeded in discovering its wealth. Under different companies the mine has divided among shareholders some £800,000. From the year 1814 to 1848 it returned the large quantity of 307,970 tons of copper ore, which realized £1,879,735. In 1833 £60,480 was divided among the holders of 96 shares. At this time the shares were negotiable at £2,700 each, £20 paid. The Killifreth 'sett' is another historical property enjoying the attention of "an influential group." The property is just south of the Great Busy mines, and north of the celebrated Gwennap, and is considered by local authorities as one of the best pieces of mineral ground in the district. It is probable that a large part, if not the whole, of the capital, will be subscribed privately. Sufficient work was done in the old mine when last worked to prove that the lodes approaching the cross-course gave every indication of yielding large quantities of mineral. Tin mining in Malay is also not without its admirers. The shares of the Lahat Mines, Ltd., have been put upon the market. This company, which has a capital of £120,000 in £1 shares, all issued, states that it has acquired, as a going concern, a group of tin mines of an area of about 172 acres, situate at Lahat, in the Malay Peninsula. The mines are said to have been worked for some years by Chinese tributers under a primitive and wasteful system, but have, it is now reported, produced regularly for some time past from 20 to 60 tons of the metal per month.

As a sequel to the formation of the new company and the provision by underwriters of £75,000 cash for working the Bonmahon copper mines, a large company of pressmen and engineers visited the company's properties lately at the invitation of the directors, and inspected the newly re-opened workings. The mines are situated in the village of Bonmahon, 17 miles from Waterford, and, though really not more than 14 hours distant from London, are somewhat "in the wilds." According to one of the numerous and enthusiastic accounts published for the information of the public that "deeply needs instruction" on the subject, every arrangement for the comfort and convenience of the guests had been made by the company and it seemed that every jaunting-car in the South of Ireland had been 'commandeered' for the occasion. Great interest was aroused in the neighborhood by the appearance of such an unwonted concourse of strangers, the peasantry turning out to do honor to the visitors, who, they believed, had come over expressly to restore a once-prosperous, but long-since decayed, industry of Ireland. After pleasantly occupying some hours in a "thorough inspection" of the properties, the company returned to Waterford, where, in the evening, a banquet was held, under the presidency of Sir James Power. The chairman, in a very interesting speech, outlined the program of the syndicate that owns the Bonmahon mines, and expressed the belief that a great step forward was being taken in restoring to Ireland one of her former industries. It is now confidently asserted that the Company will begin to pay dividends in 1907.

According to news from India, the reports from the Mysore mine continue to be of a most satisfactory character. In the No. 1 winze below the 3,226-ft. level north of Ribblesdale's shaft the lode is 5 ft. wide, assaying 2 oz. 5 dwt. 7 gr. The No. 2 ends north and south of the above winze are also opening up good ground. The lode in the former is 5 ft. wide, assaying 2 oz. per ton, and in the latter it is 5 ft. wide, with an assay-value of just under 1 oz. 18 dwt. The new discovery in McTaggart's section continues to open up well.

Interest is being maintained in San Francisco del Oro, the shares of which have risen some 10s. in price during the fortnight's account just closed. In issuing the accounts for the year ended December 31 last, the directors state that sales of ore, rent, &c., have realized £47,591, while the net profit over all expenses is £25,880. Including the balance of profit brought forward, the total profits to be dealt with are £50,201. It has been necessary to put the whole of these profits back into the mines in the form of capital expenditure. The directors have written £25,022 off in respect of depreciation and development, leaving £25,179 to be carrid forward. Within the past few weeks a considerable amount of further working capital has been subscribed in respect of part of the unissued shares, and sufficient capital has been thus provided to meet all expenditure up to the end of 1907, independent of any income from the sale of ore to the smelters. The ore reserves already actually developed amount to 280,000 tons of good ore averaging about 26 oz. silver, 11% lead, 25% zinc, and a little gold. The completion of the fourth level should add another 200,000 tons of ore to these reserves. It is expected that shipments will shortly be resumed as there are considerable reserves of shipping ore above the third level. A large proportion of the zinc values, which have hitherto been entirely lost, can now be profitably recovered, and when the process is settled it is intended to erect a plant capable of dealing with fully 200 tons per day. The directors having cabled the manager for confirmation of the reports that a water supply had been struck, and that a body of rich ore had been discovered, the following cablegram has been received. "Reports are true. Late development shows very considerable improvement. Assays of highly satisfactory character. Silver 1,620 grams (52 oz.); gold, 5 grams; lead, 23 per cent; zinc, 25 per cent."

The change in the management of Stratton's Independence, referred to in my correspondence of last week, is now confirmed by the directors' annual report for the twelve months to June 30 last. It states that the revenue account at the mine shows the sales of ore to have realized £256,726, of which £186,424 is on lessees' account, £70,302 being the total royalties and percentages of profits retained by the company, or 36.87%. Three dividends, each of 6d. per share, were paid, amounting to £75,000, the last distribution on April 10, 1906, bringing up the total of dividends paid since the incorporation to £979,173. After providing for these and sundry writings off, the balance on June 30 last was £25,090. Mr. George A. Schroter, in his report, says: "You must expect a steady decrease in production until such time as it is feasible to treat much lower grade ores. An examination of the Stratton mine proved the following: First, that there is 600,000 tons on the dumps of an average value of $3.70 per ton. Second, that there is between 60,000 and 75,000 tons of broken material in the stopes, assaying about $5 per ton, and which will probably cost between $1 and

$1.50 per ton to deliver to the surface. Third, that there are areas or zones on the different levels which probably will produce a large quantity of milling ore. The sampling showed the character of the material in these zones to be so spotted or irregular in values that it is impossible to judge its value without breaking large tonnages and putting the same through a mill. Experiments were made in a small way on samples of dump material, the results of which would seem to prove that previous estimates made on dump ores are very conservative, that is, a profit of $1 per ton on dump material, assaying $3 per ton—and should be exceeded in practice," but he leaves it to the board to decide as to the erection of a low-grade ore mill without indicating whether in his opinion he considers such a step advisable. The manager, Mr. Charles Becker, seems more positive on this point, and urges that "something should be done" at once. In his opinion "when it comes to the milling of low-grade ores, tonnage of same will be found sufficient to keep a large plant running for many years." The manager also mentions that as regards the freight and treatment on shipping ore, owing to the action of the American Smelting & Refining Co., the treatment costs averaged about $1.25 per ton in excess of the preceding year. With regard to future earnings, Mr. Schroter considers that from a comparison of last year's results with those of the preceding year, with practically no amount of ore in sight, at the present time it is safe to say that the earnings will not be any larger than, or even as large as, the past year.

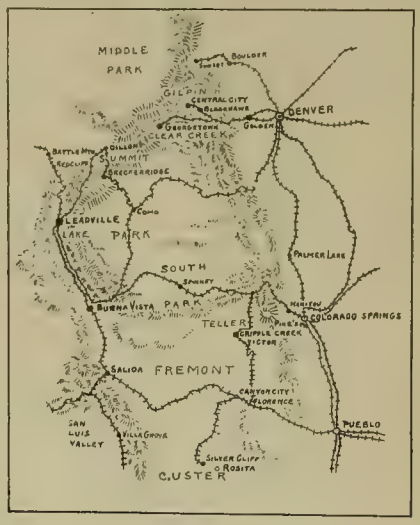
Leadville, Colorado.

General Lowering of the Water Level.—Large Orebody in the Humboldt.—The Resurrection to Resume.—Work in East Tennessee District.—George Campion Organizes Another Company.—The Helena Shipping Sulphide Ore.—A Sale at Ashcroft.

A significant feature in the local mining industry is the steady and regular lowering of the water line in the Leadville mining district proper, meaning in a general way the territory from Harrison avenue on the west to Adelade Park on the east. Properties widely separated have experienced a gradual recession of their water-level, 150 to 250 ft. being an average. The facts are that many comparatively shallow mines have been freed entirely of their water, which but a few years since made them unprofitable for this reason alone. This wonderful change has been wrought by the persistent lifting of great volumes of water by the Midas Mining Co. down town and the Yak Co. and Iron-Silver to the east.——The Humboldt mine is sending to the smelter a large quantity of silicious and carbonate ores from a new shoot opened up during the past summer. From the present stage of development it appears to be the largest shoot of this character ever opened up in the Leadville district. The ore now presents a breast of nearly 25 ft. This property has also been favored by complete disappearance of water and as a result shipments will be resumed from a large body of sulphide ore formerly opened up, but abandoned on account of the flood of water. The manager states that the water's disappearances followed the starting of pumps on the Tucson, about half a mile to the south.

Among the big producers, the Resurrection will be the largest to resume operations before the close of the year. The property is now being put in shape by B. I. Groves, the manager, and connections are to be made with the Yak adit; but as the latter is still over 4,000 ft. distant, it will require several months to make connections. An electric pumping plant is to be installed to meet the present requirements and when unwatered a drift will be driven south from the lowest level to meet the Yak adit coming from the opposite direction. This property formerly shipped, during a long period of activity, more than 200 tons daily, and just before being abandoned, energetic development was being pushed on the 1,100-ft. level. There are extensive bodies of ore of low-grade that with the advent of favorable smelting charges and cheaper transportation will make this property a dividend payer. ——The northern shaft of the Western Mining Co. is silent as a result of an injunction reported to have been issued by Judge Lewis of the Federal Court, granting a permanent injunction against the Northern people from further operations. A costly and tedious litigation has hampered this property in the past, and as yet there are no indications that the end is in sight.

Among the new properties to begin operations in the East Tennessee district is the Martye Bird, with F. E. Baker as superintendent. The company controls 40 acres south of the Jennie June mine, and a shaft is being sunk, from which a drift will be run to cut the Jennie June vein. Since connections were made with the Yak adit some weeks ago, the Louisville has been developing an unusually valuable shoot of zinc ore and is now shipping



A Part of Colorado.

a large tonnage.—— George Campion has consummated a deal by which a group of claims on Long and Derry hills, six miles southeast of Leadville, will soon be developed on an extensive scale. The property will embrace about 160 acres, upon which Mr. Campion has obtained a long lease, and the new hoisting plant has been completed at a cost of $25,000. Cottages are being built on the ground to accommodate the workmen with families, the idea being to obviate the usual shifting of men which would otherwise occur in the working force. The present working force amounts to 20 men, and when the shaft reaches a reasonable depth a much larger force will be added, to extend drifts now projected. Opinion is current that Mr. Campion expects to cut the big ore-shoot that he is working on the famous Reindeer. The new company is styled the Musk Ox Mining Co., and is one of the strongest organizations in the Leadville district. As is usual in the development of Leadville's mineral resources, the enterprise was instigated, and will be carried to completion, by local capitalists.—— The Helena is shipping a good grade of lead sulphide from the 300-ft. level. It is intended to unwater the workings to the bottom of the 600-ft. shaft. Since the Ollie Reed went into the hands of the Yak company a few months ago, the latter has kept up work, presumably on the higher levels where the former owners at one time shipped considerable ore of good grade; diamond drilling

is being employed to prospect the lower contact.—— Joel Smith has consummated a sale on the Tom O'Shanter group of mines at Ashcroft to a syndicate incorported as the Tom O'Shanter & Montezuma Mining Co. This property has been made famous by both its production and litigation, the latter extending over twelve years in the various courts of Colorado.

Cripple Creek, Colorado.

Strikes in the Mountain Beauty and Trilby.—Prosperous Lessees.—The Gregory to Be Worked.—Good Ore From Guyot Hill Mines.—New Rates of Ore Treatment.—A Dividend.—The Drainage Adit.

A good strike has recently been made on the Mountain Beauty Mining Co.'s property on Bull hill. John Hodges and F. R. Marsh are operating a block of ground, from the surface to the 600-ft. level under lease. A fair sized vein has been encountered in this lower level, on which active development is being done, and the lessees hope to open up as good an orebody as they are now working on the Little Clara claim of the Work Co.'s property. This new strike has caused the stock of the Mountain Beauty to rise considerably during the last few weeks. On another part of the same property, Sellers and Blanchard have discovered a new vein at a depth of 280 ft., and assays of $30 per ton have been obtained.——The Pittsburg and Philadelphia capitalists who lately bought the Trilby mine on Bull hill from the Moose Gold Mining Co. have incorporated under the title of the Trilby Mines Co. The capitalization is 1,000,000 shares at a par value of $1. James T. Stewart, one of the incorporators, will be in charge of the company's interests in the district. The price paid for the Trilby property is said to be $125,000. A discovery of ore was made by the new owners a few days ago on the eleventh level of this property; in clearing away some waste that had been left on this level a vein estimated to be six feet wide was found. It is thought that the vein was covered up intentionally by the Trilby Leasing Co., which operated this mine two years ago, the discovery being made near the termination of their lease. Indications of the find were obliterated in hopes of the lease being renewed, but an extension was refused by the Moose Company.

Lessees on the Free Coinage mine, situated at Altman, are shipping ore of fair grade. J. O. Carper, operating through the Pinto-Bison shaft, has made a shipment during the last few days, returns of which are not yet to hand.——The first clean-up is shortly to be made by the Isabella cyanide mill and good results are anticipated. Seventy-five tons of dump ore are being treated per day.

The old Hayden workings on the Gregory claim of the Elkton Consolidated Gold M. Co. have been leased to Smith & Johnson. Explorations to discover the continuation of the rich orebody formerly worked by L. Hayden, will be undertaken. After yielding around $250,000 profit to this lessee the orebody pinched out, and the property lay idle for about a year.——Two cars of ore have been shipped during the last few days from Guyot hill properties. One car was from the Aileen and the other from the Chicken Hawk mine. Returns of between $30 and $40 per ton are expected in each case. The Colorado State Investment Co. is operating the Aileen mine under the management of John Sharpe, and the Chicken Hawk by the Columbia Mining & Development Co., Charles Walden being manager.—— The South Burns of the Acacia Co. on Bull hill, operated by the Standard Leasing Co., is shipping ore that gives returns a little better than an ounce. The ore is obtained at a depth of 800 ft.——The treatment rates on ore from the Cripple Creek district have been reduced by the smelter trust. The reason for this is given out as due to the demand for ore by the United States Reduction & Refining Co. owing to the completion of the Golden Cycle mill, which will handle the outputs of the Golden Cycle, Findley, and other properties. The new rates are lower than those of the Golden Cycle, and whether the latter mill will meet this reduction remains to be seen. The change is as follows:

	Elkton.	Golden Cycle.	Old open rate.	New open rate.
Up to $10 per ton	$5.75	$.....	$6.25	$.....
$10 to $15	6.50	5.75	7.50	5.50
15 to 20	6.75	6.50	8.00	6.00
20 to 25	7.25	7.50	9.00	6.25
25 to 30	7.50	7.75	9.25	6.75
30 to 40	8.50	8.75	10.25	7.50
40 to 60	9.25	9.50	11.00	8.50
60 to 100	9.75	10.00	11.50	9.00

From the above table it is seen that there will be a reduction in cost of treatment between $2 and $3 per ton, which will materially aid in the marketing at a profit of the low-grade ores of the camp.

A dividend of $30,000 or two cents per share has been declared by the Work Mining & Milling Co. During the last eight months ending November 30, a profit of $79,473 has been made—about $10,000 per month. Dividends amounting to $60,000 have been paid, leaving $19,473 in addition to the balance on hand April 1, of $13,143.——A strike has been made on the Four Brothers claim of the Agnes Co. situated on the east slope of Beacon hill. Driving has been going on at a depth of 250 ft. in an easterly direction to catch a vein opened up on the 150-ft. level above. The vein is four feet wide, averaging around $40 per ton, while a 10-in. streak shows values of several hundred dollars per ton. The Wabash Leasing Co. is operating this property, several of the county officials being interested.

A meeting was held at Colorado Springs on December 18 of Cripple Creek mine owners, when nearly $1,000,000 was pledged for the driving of the big drainage tunnel. A resolution was passed calling for the work to be commenced at the earliest possible date, which will be about January 15. As soon as the project assumes definite proportions, the smelters, mills, and railroads will come in and help the undertaking. In view of the commencement of operations, the stocks of the properties that lie in the immediate line of the tunnel have strengthened considerably.

Salt Lake City, Utah.

Mineral Output of Utah.—Dividends Paid During 1906.—Smelter Smoke Troubles.—Removing Operations.—Electrical Plants.—Railroad to Pioche.—Sundry News.

According to authentic figures recently released (the month of December estimated) the metals produced in the mines, smelters, and mills of the State during the year aggregated the sum of $38,042,383, the classification being as follows:

470,976 oz. gold at $20.67 per oz., $9,735,082; 15,981,315 oz. silver at 66.585 cents per oz., $10,629,547; 67,303,376 lb. copper at 18.95 cents per lb., $12,744,988; 115,018,811 lb. of lead at $5.635 per 100 lb., $4,480,310; 6,472,734 lb. zinc at $6.153 per 100 lb., $398,267; 1,276 flasks of quicksilver at $42.50 per flask, $54,187. In some instances it has been impossible to segregate ores coming from other States, but an allowance for this of $5,000,000 has been made, leaving a net result therefore of over $33,000,000 as representing the value of the gold, silver, lead, copper, zinc, and quicksilver ores extracted from the mines of Utah alone during the year 1906.

The dividends paid during the present year aggregated a total of $5,148,044 and the mines credited with these

payments, together with the respective amounts were: Beck Tunnel Consolidated, $305,000; Bingham-New Haven, $22,600; Bullion Beck & Champion, $40,000; Carisa, $30,000; Consolidated Mercur, $100,000; Daly West, $432,000; Gemini, $200,000; Grand Central, $172,000; Horn Silver, $80,000; Mammoth, $140,000; Mountain View, $12,554; Petro, $32,000; Sacramento, $40,000; Silver King, $800,000; Swansea, $18,000, Utah (Fish Springs) $34,000; Utah Consolidated, $1,350,000; Uncle Sam Consolidated, $50,000; United States, $1,099,907; Victoria, $125,000; West Mountain Placer, $2,483; Yankee Consolidated, $42,500. The Utah Consolidated Mining Co. has posted a regular dividend of $2.50 per share and an extra dividend of 50 cents per share, payable in January. The Daly Judge of Park City has posted its initial quarterly dividend of 37½c. per share, or $112,500 for payment on January 12.

The Utah Consolidated Mining Co. has decided to abandon its smelter near Murray, south of Salt Lake City, as a result of the smelter smoke troubles. A new



Utah.

plant will be built, outside of the agricultural districts of the Salt Lake valley, at a cost of about $1,000,000. It is also the intention of the company to engage in the treatment of custom ore. The site of the proposed smelter has not been settled, five sites are under consideration. The plant to be abandoned is treating between 800 and 900 tons per day and began in 1899 with a total capacity for the treatment of 200 tons per day; since it went into operation 1,500,000 tons of ore have undergone treatment in its furnaces, from which has been won about 90,000,000 lb. copper. R. H. Channing, Jr., who has been manager of the company since its organization in 1899, has resigned to accept the presidency of the Cerro de Pasco Mining Co. and the Cerro de Pasco Railway Co. in Peru, the same to take effect in January. His successor has not been named.

The Consolidated Mercur will not report the usual production of gold this month owing to a shortage of fuel, which has compelled a shut-down of the roasting furnaces in its milling plant. Other mines have been affected in the same manner, but none so seriously as the Mercur. ——The management of the Columbus Consolidated at Alta has installed an electric pump capable of raising 400 gal. per min. from the 300-ft. level below the adit.—— The Little Chief mine in the Tintic district is being operated with its new hoist, and will soon be producing again.——The Boston Consolidated Mining Co. has awarded the electrical contract for its Garfield mill, which is to have a capacity of 3,000 tons of ore per day, to L. M. Cargo, the local representative of the Westinghouse Electric & Manufacturing Co. It calls for the entire electrical equipment of the plant and the payment therefor of about $50,000.

Ore shipments have recommenced from the Last Chance mine at Bingham; this mine is operated under the control of the Nevada Utah Mines & Smelters Corporation. ——A controlling interest in the Ohio-Kentucky Mining Co., at Pioche, Nevada, has been acquired by Samuel Newhouse, who has been elected president of that corporation. J. Ross Clark, vice-president of the San Pedro, Los Angeles & Salt Lake Railroad has made the statement that the contract for the grading of the proposed branch line from Caliente to Pioche will be awarded in a few days and that the laying of track will begin as soon as it is possible to get ties. The road will be about 30 miles long.——The Majestic Copper company, operating in Beaver county, is shipping a carload of copper ore daily from the Old Hickory and a car per week from the O. K. mine.——The Cedar Mining Co. has struck some high-grade silver ore in its shaft at a depth of 275 feet.

Butte, Montana.

Number of Men Employed.—Output of Ore and Contents.—Rich Ore in Alliance.—Operations of Amazon-Butte.—North Butte.—Explorations by Butte & Bacorn.—Final Payment on the Ophir.—New Machinery.—Recent Incorporations.

The average number of men employed in the Butte mines is: Amalgamated Co., 6,600; North Butte, 500; Butte Coalition, 1,400; Original, 1,150; Pittsburgh & Montana, 375; others, 1,620. Total, 11,705. The daily payroll for miners and surface men prior to November 15, the date of the raise in wages, was $40,965. The monthly payroll prior to that time was $1,228,955. The monthly payroll since November 15 averages $1,316,735.——The estimated tons of ore mined by the various companies during the year were: Amalgamated, 4,000,000; Coalition, 390,000; United Copper, 90,000; La France, 47,450; East Butte, 72,000; miscellaneous, 328,000. Total tons, 5,715,850.

Estimates of copper, silver, and gold production of the Butte district, during the year now ending, have been made as follows:

Company.	Copper, lb.	Silver, oz.	Gold, oz.
Amalgamated	278,000,000	7,623,470	45,134
Butte Coalition	24,000,000	940,000	1,000
United Copper	7,500,000	250,000	1,000
Original	116,000,000	1,000,000	1,000
La France Copper	4,745,000	800,000	1,350
Pittsburgh & Montana	485,000	850,000	900
North Butte	40,000,000	2,000,000	1,000
Miscellaneous	10,000,000	2,000,000	1,100
Total	380,730,000	15,463,470	50,384

The Alliance Mining Co. has begun making shipments from the rich vein of copper it struck at a depth of 200 ft. recently. The first lot of 60 tons yielded about 11% copper, some of it assaying as high as 50%. The company expects to be able to ship 40 to 50 tons daily in a short time. Driving is in progress both east and west on the vein, which is eight feet wide, four feet of it being first class. The ore also assays well in silver, the average being about 7 oz. per ton, with $2 in gold, making the gross value of the ore about $55 per ton. Only Butte men are in the Alliance Co., and they own all the stock. The Alliance has 1,300 ft. of the vein, although there is a short piece of ground within that distance owned by

outside interests. The Farrell Copper Co. also owns a good bit of territory on the same vein and is developing it through the Alliance shaft, which was sunk jointly by the two companies. There is some talk about a consolidation of the two companies, but so far nothing definite has been done. The Farrell has several known veins within its boundaries. The Alliance vein has been traced for a distance of more than a mile, through the ground of the Ophir, owned by the Butte Central & Boston Copper corporation, and east through the Alliance and Farrell ground, and through a big tract of ground owned by the East Butte Copper Mining Co., far south of any of its present mines and workings, and in ground purchased by that company some time ago, to be used for the operation of a precipitating plant on the old Parrot smelter tailing, which covers that ground.

None of the new mining companies organized in Butte during the past year has made better progress than the Amazon-Butte Co., which was organized only two months ago and has erected a number of permanent buildings, a large and complete plant of machinery now running perfectly, and has a double-compartment shaft down 100 ft. The company owns the Amazon, West Altona, and Gaynor lode claims, all patented many years ago, situated about a quarter of a mile south of Bullwhacker, and covering for more than 1,000 ft. the main north and south fault-vein that is so prominent in the Bullwhacker. The Amazon group also adjoins the properties of the Ida-Montana Co. on the west and covers 1,600 ft. of the main Ida east and west vein, from which that company has extracted excellent sulphide ore at a depth of only 110 ft. The Amazon ground also contains four other distinct veins. The location of the shaft was selected as being some distance from any vein, yet it dropped down upon an unknown vein 12 ft. wide at a depth of 50 ft., from which highly mineralized vein-matter and some ore has been taken. The shaft should reach a depth of 500 ft. by May, when cross-cuts will be started, while sinking of the shaft progresses to a depth of 1,000 or 1,200 ft. A number of lessees are working in Amazon ground on the Bullwhacker fault-vein and are opening another big deposit of silicate and carbonate ores, almost identical with that found in the Bullwhacker, and at a depth of 60 ft. they have found several bunches and streaks of copper glance. The discovery of sulphide ore at a slight depth in conjunction with the large deposits of copper ore in the fault-vein, is said to indicate the proximity of larger and richer bodies of sulphide ore than have heretofore been discovered in that locality. E. H. Wilson, mining engineer for F. A. Heinze, and W. Spencer Hutchinson of New York, have examined the property and are outspoken in their high opinion of the showing made with so little development. The present company is merely a co-operate enterprise of several prominent Butte men that owned the claims, and there was not a share of promoter's stock allowed to anyone. The mining operations are managed by John Hewett, who was for many years superintendent of the Gagnon mine, owned by the Amalgamated Company.

The North Butte Co., in driving a cross-cut north from the 1,600-ft. level of the Jessie mine to reach the Berlin claim, has cut into another big vein in the Jessie ground. It is claimed to be some 20 ft. wide, and that nearly all of it is first-class ore. It is uncertain where the vein apexes, whether in the northern part of the Jessie or in the Gem, a small fractional claim purchased not long ago by the company from J. A. Murray and others. The North Butte now has four large veins — the Speculator, Edith May, Jessie, and the new one. The company expects to find another big vein in the Berlin ground, but that will not be reached within another year. It is possible, however, if the North Butte's phenomenal luck holds out, that three or four other veins may be cut before the Berlin is reached.—— The vein being opened in the combination mine by the Reins Copper Co. is growing larger, and is now carrying commercial ore for a width of 10 ft. The vein has been opened both on the 900 and 1,000-ft. levels, and a considerable quantity of ore is being hoisted. It is likely that another cross-cut will soon be started from the 1,200-ft. level.

The Butte & Bacorn Co.'s north cross-cut from the Calumet shaft at a depth of 500 ft. passed through a barren vein 17 ft. wide. The only values it contains at that depth are 5 oz. silver per ton, and about 1% copper. The vein is dry, indicating that the water-level has not been reached and that the minerals have been leached out to that depth. They will probable be found deeper in the vein, in the form of glance and bonanza ore. The barrenness of the vein does not surprise the management. At the 700-ft. level the Edith May vein of the North Butte Co. was absolutely barren, but at the 1,200 and 1,600 levels it was tremendously rich. There is no working on the Edith May vein between the 700 and 1,200-ft. levels, and it has therefore not yet been ascertained at what point the mineral deposits begin. It is probable that the Butte & Bacorn will not run another cross-cut until the Calumet shaft reaches a depth of at least 1,000 ft. The Belinda shaft, being sunk a short distance north of the Calumet, has reached a depth of 600 ft. It is the opinion of everyone familiar with the Butte & Bacorn ground that copper ore must exist in commercial quality within a depth of 1,000 feet.

The final payment on the purchase of the Ophir mine has been made by the Butte Central & Boston Copper Corporation, which took over the property on July 1, after an examination and favorable report made by several engineers sent to Butte by Freeman I. Davison and his associates of Boston. At that time the shaft was less than 300 ft. deep, and it has been sunk to the 500-ft. point, where an 800-gal. pump has been placed. In all the levels, four in number, fine bodies of silver ore have been opened, some of it showing good values in copper. The cross-cut on the 500 has disclosed 18 ft. of ore in place. Besides carrying high values in silver and gold, this ore shows copper glance and sulphides, so as to assay as high as 7% copper. Although the ore occurs in quantity, no shipments will be made until the new surface plant, now being installed, is ready for operation—in about 30 days, at which time all leases on the property will have expired. It is said that shipments of ore will then begin on a large scale, at least 200 tons per day. The shaft will be sunk at the same time and will be continued to a depth of 2,000 ft., with cross-cuts at every 200 ft. The new company has acquired additional property since it purchased the Ophir, and negotiations are under way for more. The latest acquisition is the Boyer mine, a small property on East Park St. in the city, on which there is a shaft 215 ft. deep, and from which some ore has been taken.—The North Butte Mountain Copper Co., which has a locator's rights to mineral ground in the Butte & Bacorn section of the district, announces that it will begin work soon. The company is capitalized for $5,000,000 in 1,000,000 shares.

The Golden Sunrise Mining Co. has been incorporated by Kansas and South Dakota men to operate in the Butte district. It is capitalized for $1,000,000 with shares at $1 each. The directors of the company are J. L. Penny, A. H. Shaffer, J. E. Shaffer, and I. Brubaker of Topeka; L. L. Stephens, F. A. Stephens, and B. J. Binford of Pierre, S. D.—The new hoisting engine on the Greenleaf, owned by the Boston & Montana Co. has been fin-

ished and sinking has been resumed.—The new machinery installed on the property of the Colusa-Leonard Extension Co. is working nicely and good progress is being made in sinking.

Toronto, Canada.

Cobalt News.—Rich Ore in the Government Mine.—Prospectors Still Arriving.—Sturgeon Lake.—Treatment of Cobalt Ores.—Oil in Ontario.—Search for It Farther West.

W. G. Miller has returned from the Gillies Limit, Cobalt, and expresses satisfaction as to the discovery made in the vein, which was found in driving on the 70-ft. level at about 18 ft. from the shaft. The wall of the vein is being laid bare, indicating a solid orebody extending to the surface. A rich sample of the ore from this vein has been received by the Provincial Bureau of Mines.——Henry G. Adler has been appointed general manager of the Foster mine at Cobalt. He has had experience in South Africa and was for three months in charge of the University mine.——At the Trethewey mine a new vein has been discovered 50 ft. below the surface. It is only two inches wide, but carries very high-grade ore. About 90 men are at work. No. 1 shaft is down 120 ft., and driving has been done at the 50-ft. and the 100-ft. levels. The east drift on the 50-ft. level is 160 ft. long, and to the west it extends 60 ft. At the 50-ft. level a cross-cut has been started to encounter two veins found on the surface about 60 ft. apart. Two 80-h.p. boilers, a duplex compressor, hoist, and dynamos have been installed. Frank C. Loring has resigned his position as general manager of the company, but will remain in their service as consulting engineer.——The United Cobalt Co., which recently acquired several Cobalt properties, has a gang at work under Algernon Del Mar, a mining engineer from California, as superintendent. Shafts will be sunk and energetic development proceeded with.——The shaft on the main vein at the O'Brien mines is now down 300 ft. and active prospecting is being done on the southeast part of the property.——About 12 men are at work on the Gamey property belonging to Gamey & Wright, north of the Buffalo mine. A small calcite vein followed down 24 ft. has widened; it shows cobalt and niccolite.——At the Green-Meehan, large deposits of silver ore running as high as 4,000 oz. per ton are exposed on vein No. 1. It is stated that the output on December 19 and 20 amounted in value to $25,000.——S. Price, the Mining Commissioner, arrived here on Wednesday from Cobalt. He reports that notwithstanding the wintry weather and the depth of snow on the ground, prospectors are still arriving and that six or eight new claims are recorded every day in the Haileybury office.

Charles Giffard, a Western miner, is developing, for a company whose name does not appear, a 20-acre property adjoining the Nova Scotia, Nipissing, and O'Brien properties. He has done about 1,000 ft. of trenching and has disclosed nine veins, one of which is a continuation of the Nova Scotia vein. Two shafts are going down, one of which is sunk 20 ft. and the other 24 ft. A plant comprising two steam-hoists, a six-drill compressor, and two 60-h.p. boilers has been ordered from the Rand Jenckes Co.——A. McEwen, manager of the Sturgeon Lake gold mine, in northwestern Ontario, has arrived at Port Arthur with gold bars of the value of $8,000, the result of a six-weeks' clean-up. The concentrate will be of about equal value.

Experiments have for some time been carried on under the direction of Wills & Co., Toronto, in the treatment of Cobalt ores. They claim to have solved the problem satisfactorily, and are having a model plant constructed here for the carrying out of their process, which it is stated will be equally available for the treatment of British Columbia gold quartz—rendering it profitable to reduce quartz ore assaying as low as $5 per ton. The plant is operated on the principle of pneumatic concentration and employs no water. There are six inclined cylinders through each of which a shaft passes, and attached to the shafts are brushes revolving by means of level gears. The material, introduced automatically from bins above, is kept in rotation by the brushes, and the mineral content being heavier than the refuse, falls into the receptacle of the cylinder. A current of air introduced by a suction-fan at the upper end of the cylinder, carries away the gangue or tailing, which is forced up the cylinder and falls into a chamber, from which it is dropped by an automatic valve. The metallic contents of the ore, being too heavy for the air current to carry, work down against the air, and are released at the lower end of the cylinder. The air current can be closely regulated. The material is carefully sized, each size being fed to a separate cylinder. The process is regarded as being especially valuable in the treatment of low-grade ores at a distance from smelters. Some $30,000 has already been spent in experimenting on the process.

There is much excitement over a new strike of oil in Romney township, Kent county, Ontario, in what is known as the Tilbury oilfield. The well is situated on the farm of J. A. Tremblay, about six miles south of the scene of active operations. The strike occurred on December 19 and oil gushed out in such profusion that at least 1,000 bbl. escaped. The well is only 300 ft. deep. Oil rights on M. Campbell's farm, Tilbury East, have been sold by the Campbell Oil Co., of Detroit, to A. D. Adkin, Spencerville, Ohio, and C. M. Vanburen, of Bolivar, New York, for $56,000.——Eugene Coste, of Toronto, who has traveled extensively through the Canadian West during the past season in connection with the development of the oil resources of that region, states that so far no oil in any quantity has been struck. The Alberta Oil Co. has a well down 1,585 ft. at Pincher Creek, south of the North Kootenay pass, and has found a little oil. They will sink to a further depth. Mr. Coste is acting as engineer for the Canadian Pacific Railway, which has gone down 800 ft. and got a showing of gas. They will sink 2,000 ft. further if necessary in the hope of obtaining oil to use as fuel for their locomotives. The company has another well at Langham 1,000 ft. down, and will sink to 1,700 ft. Small results have been obtained by the Rocky Mountain Development Co. and the Western Oil & Coal Consolidated Co., operating in southern Alberta. Mr. Coste thinks that drilling operations have not so far been conducted on a sufficiently extensive scale to determine whether oil exists in paying quantities.

The mining rights to the bed of Cobalt lake, covering an area of 46 acres, recently advertised for sale by tender, have been sold by the Provincial Government for $1,085,000 cash. The purchasers are a syndicate composed of several hundred subscribers, contributing not less than $1,000 each, the principal promoters being Pellatt & Pellatt, and Britton Osler, of Toronto; Thomas Birkett, Geo. F. Henderson, and D. B. Rochester, of Ottawa, and Raymond Mancha, of Detroit. Five tenders in all were received, but two of them were not accompanied with the requisite cash deposit. There will be no royalty required on the output. Kerr lake, offered for sale at the same time, was not disposed of, as the highest tender was only $51,500, which was not considered good enough. A tender from parties represented by Miller, Ferguson & Hunter, and T. A. Beament, of Ottawa, for the mining rights of about 14 miles on the right of way of the Temiskaming & Northern Ontario railway, subject to a 25% royalty on the output, for $38,100 cash, was also accepted.

Mining Summary.

ALASKA.

The report circulated in Seattle that the Treadwell mines will close down on account of a shortage of coal is denied by the management. While the fuel situation is admittedly serious, the weather is moderating and a plentiful supply of water is anticipated. Robert A. Kinzie, the manager, in a late interview at Seattle, stated that while he had found it impossible to obtain coal anywhere in the United States, a plentiful supply had been ordered and was now on the way from Australia. Dispatches announce the arrival of the steamer Farallon at the Treadwell docks with 500 tons, and more boats on the way. A large oil-burning plant has already been installed, and will be in operation early in January. With ample water and a small amount of coal the mine can be kept running until oil supplants coal as fuel.

ARIZONA.

COCHISE COUNTY.

Following the discovery of orebodies in the Denn-Arizona, comes the news of a similar strike in the main workings of the Empire State, a property lying on the outskirts of the Warren district. About two weeks ago good ore was encountered while driving on the lode in the main shaft; since then the drift has advanced entirely in ore. The vein has a general trend from northeast to southwest, and has been cut by an adit 443 ft. long. As soon as this vein was encountered, a drift was driven which has now run 100 ft. in a southeasterly direction on the lode. A sample of 200 lb. has been sent to the smelter at El Paso. Hitherto the ore has carried values in gold and silver only, but during last week copper in the form of bornite and malachite has been showing strongly. A cross-cut will be started at once to determine the size of the orebody.

PINAL COUNTY.

The Silver Queen, a gold and silver proposition in the Superior district, has encountered a vein of carbonate ore in driving the old drift on the 300-ft. level. This ore assays 18% copper, and carries a large percentage of iron. There are about four feet of this ore in the face of the drift. Between this orebody and the quartzite, a large seam of copper glance was discovered that assayed 91 oz. silver and 58% copper. In a raise from the same level another vein was struck that carried 31 oz. silver and 46% copper. This vein is to be opened up as fast as practicable, and a winze is being sunk from the 300-ft. level. The 400-ft. level has also been re-opened and put into good shape, and here a good body of ore has been found assaying 17 to 28% copper. The company is now in a position to commence regular shipments to the Humboldt smelter, if teams can be secured to haul the ore to the railroad at Florence.——A carload of ore shipped recently from the Eureka group of copper mines situated at the Summit, 20 miles east of Florence, nettod $800 at the smelter. The main shaft is now down 158 ft., and a cross-cut back to the vein from the bottom of this shaft reveals a body of ore seven feet wide. On the hanging wall is a two-foot streak of shipping ore, and the assay average of the ore across the whole seven feet is about 7% copper. Two other lenses of pay-ore, dipping east in the vein, have been opened. This ore carries copper, gold, and silver.

GILA COUNTY.

(Special Correspondence).—Eastern people, as yet unknown, this week bonded three groups of 31 claims located five miles northwest of the city and a large force of men is at work on initial development work. The amounts to be paid for the claims aggregate $300,000, final payment to be made in 18 months. The deal was consumated through F. J. Elliott and F. C. Alsdorf, the latter being retained as general manager for the purchasers.——On Saturday the Globe Consolidated struck a five-foot vein of sulphide ore in a new cross-cut on the 400-ft. level of the Mallory shaft. The management expects to begin shipments to the Old Dominion smelter within a few weeks.——The railroad of the Arizona Commercial Copper Co. is rapidly nearing completion. The road will connect the Blackhawk and Copper Hill mines of the company with the road running to the Old Dominion smelter, and heavy ore shipments will begin as soon as the road is completed. The company will also ship carbonates from its open-cuts to smelters at Douglas, Cananea, and Clifton. This is said to make the finest converter lining in the Southwest and is in considerable demand by the smelters.——Tucson capital has invested in Globe district, Mose Drachman of that city and associates having closed a deal for three claims and a 160-acre ranch within a short distance of the new Mitchell smelter site. The consideration was $100,000. It is believed that the ranch will be converted into a townsite. It is located three miles from Globe and within easy walking distance from the new smelter. Construction of the extension of the Gila Valley railroad to the smelter site will begin the lattter part of this week.——The fuel situation here is much better than in any camp in the Southwest, judging from reports from Bisbee, Douglas, and Cananea, at which places the oil and coal shortages has threatened to close mines and smelters. There is plenty of both kinds of fuel here to run indefinitely.——Reports from the Queen mine at Superior state that during the last week a 2½-ft. vein of solid glance has been encountered and a car of ore assaying 60% copper and 100 oz. silver will be shipped to the smelter at Humboldt, Ariz. This mine is an old silver mine that was abandoned a number of years ago and it was recently purchased by a number of Globe business men, who are now operating it.——The new 100-ton concentrator of the Pinto Creek Mining Co. will be placed in commission soon after the first of the year, the work of construction and installation of machinery having been completed. The 75-ton mill at the Inspiration mine will be started at about the same time.

Globe, Dec. 25.

(Special Correspondence).—Operations at the Dominion smelter at Globe are continuing satisfactorily. Until the last week or two the smelter was handicapped by a lack of sulphide ore, but recently shipments of sulphide began from Cananea and Nacozari, in Mexico. The shipments will continue, enabling the company to resume smelting with four furnaces without interruption until the end of the month, so that there will be no reduction of output. Trouble has been experienced in securing an adequate supply of fuel oil, owing to a tank-car famine, and as there is no prospect of relief, the company has decided to use coal, which will be supplied by the Dawson mines in New Mexico, owned by the Phelps-Dodge Co. Shipments from the Continental mines now average 65 tons daily, and the development of sulphides in the lower levels of the Globe, the principal mine of the Old Dominion, is satisfactory. The west drifts on the thirteenth and fourteenth levels are both in good concentrating sulphide ore.——Another big mining transaction has just taken place, consisting in the sale of the Chapparal group of 13 claims northwest of Gibson, and the Halliday group of four claims lying between Gibson and the Chapparal group. The company that is to operate the Chapparal is to be known as the Union Copper Co.——The Pennsylvania Co. has been re-organized under the name of the Pennsylvania, Cananea & Globe Co., and has taken over control of the properties formerly operated by the Five Points Mining Co. at Globe; these will be worked in connection with the South Cananea properties of the old corporation. Preparations are complete for extensive development at the South Cananea, where the heavy machinery necessary for further sinking is now in place. George Mitchell, who was superintendent of the old company, will serve in like capacity for the P. C. & G.——Globe capitalists have formed a corporation to develop and operate 12 claims situated on the southeastern slope of Pinal Mtn., six miles south of Globe, and comprising a part of the Bremen holdings.

Phoenix, Dec. 26.

SANTA CRUZ COUNTY.

An important sale has been made in the Patagonia district, the 3-R group of copper claims having been purchased by C. W. Greene. The group is situated within a few miles of Patagonia, and is in close proximity to the Flux mine, which recently changed hands also, having been sold to Henry Gray. The former owners of the 3-R group had

spent a good sum in developing the property by means of shafts, adits, and cross-cuts, and several orebodies were opened up assaying well in copper and gold. The mine is easily accessible, and offers an excellent site for the reduction works which will be installed in the near future.

YAVAPAI COUNTY.

(Special Correspondence).—In the Lelan mine at Chapparal, several new orebodies have been opened up.—— The H. J. Beemer Co. is developing its property by an adit on the copper vein, and by a shaft that recently cut the Ten Spot lode.—— The Senator adit, which is being driven by the Commercial Mining Co. (Phelps, Dodge & Co.), is now 3,000 ft. long. The next large vein to be cut is the Snoozer, about 600 ft. from the present breast.—— The once famous Peck mine is being re-opened by the Great Peck Mines Co. A new shaft 385 ft. deep has been sunk, and a level (now about 460 ft. long), is being extended toward and under the old workings, from which the bonanza ore was formerly taken, in an attempt to find other valuable orebodies.—— The Jessie mine and the Dividend property, both at Chapparal, have again been started up.——The second payment in the Dunkirk deal, arranged a few months ago, has been made. The mine is being moderately developed.

Prescott, Dec. 20.

CALIFORNIA.

AMADOR COUNTY.

Further details of the transfer of the Wildman-Mahoney properties announced in this journal on December 1 are now to hand. The shareholders of the Mother Lode Co., which acquired the mines from Bishop & Spring, have elected J. Overhault, of Pittsburg, as president. The Pacific Coast directors are Homer Wilson, John A. McIntyre, John Ross Jr., and Jackson Dennis. A few months ago a large vein of pay-ore was uncovered in the Wildman, which has determined the company to spend over $700,000 in development work in the next three years. The Emerson shaft will be completed and a modern mill erected. It is now understood that the back debts of the Wildman mine will be paid by instalments, and that John Ross Jr., the superintendent for the old company, will be retained by the new owners.

EL DORADO COUNTY.

Morgan, Forni, Smeeder & Vaugh made a strike of a good pocket in the Cranes Gulch property last week, taking out in six or seven days about $7,000. This is a pocket deposit that has produced for years, but not regularly.——Kerr and associates are driving in some very rich gravel in the old Jones Hill property on the Middle Fork of the American River, at the junction of Canon Creek river.—The Beatty claim at Georgia Slide is in good ore. These are old diggings that have produced since 1852, and have a record of several million dollars to their credit.——On the Blue Rock claim, the north extension of Beatty, one man at work upon this property has put in 42 years of continuous labor. This mine has also been a regular producer for 50 years.——Mining is just beginning for the season in this district, as the rains were late in commencing, the last storm being the first of any importance.

El Dorado, Dec. 26.

NEVADA COUNTY.

A new mine is to be opened up at Deadman's Flat, consisting of a group of claims adjoining the Gold Mound, and lying between that property, the California, and Kenosha. This group, known as the Olympus, contains the extension of the Gold Mound lode. The outcrops are bold, and at slight depth the vein becomes solid and well-defined. A force of men has been busy tracing the lode, sinking prospect shafts, and taking samples. A working shaft will be sunk, and the property developed in a thorough manner. ——Exceptionally high-grade ore has been recently encountered at the Arctic mine in Canyon creek, seven miles above the town of Washington. Assays range from $12.60 to $45 per ton, occasional rich stringers running much higher. The property is in the immediate vicinity of the Ethel and Grey Eagle, and the lode which is being exposed by prospect shafts, is five feet thick. The company engaged in prospecting the Arctic has also acquired the Lecompton mine on Deer creek, just above Nevada City, and will shortly begin work on that property, operating it in conjunction with the Arctic. The Lecompton was originally located by the late George Hearst in 1857. When the Comstock excitement broke out, Hearst sold it to J. J. Ott, the veteran assayer of Nevada City. Senator Hearst and associates took a fortune from the mine, which has produced upward of a million dollars from the 500-ft. level to the surface. The present company will sink 200 ft. farther and drive drifts on the 600 and 700-ft. levels preparatory to stoping. The mine is equipped with a good hoisting and pumping rig, a modern 10-stamp mill, concentrators, dynamos, and slime plant.——One of the richest strikes made for some time in Nevada county has taken place at the Colfax mine in Willow valley, just east of Nevada City. In driving a cross-cut to develop a vein that was exposed in the 60-ft. shaft, a rich stringer was encountered assaying $2,700 per ton. The vein is encased in a heavy gouge that is being sacked for shipment. E. A. Work and J. A. McKinney recently secured a bond upon the Colfax.

COLORADO.

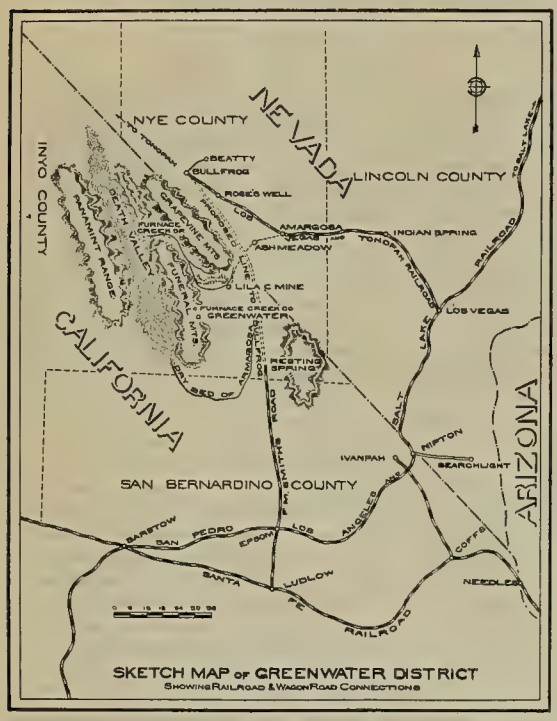
CLEAR CREEK COUNTY.

(Special Correspondence).—The Lincoln Mtn. Co. has resumed work on its cross-cut adit, which is now in 800 ft. The old Virginia City mine will be developed by 600 ft. of driving, considerably deeper than the old shaft workings from which over $250,000 were taken. —— The Maud S. property, which has produced ore yielding as high as 600 oz. silver per ton, has been leased and bonded to Denver capitalists. The main adit will be driven ahead, in order to intersect the Maud S. vein in about 50 ft. —— The Key West Co. is starting its lower adit on the McKinney lode. This will give an increased depth of 215 ft. E. W. Sheppard is manager. A power plant for machine-drills will be erected early next year. —— Bids have been asked for furnishing lumber for a mill with a daily capacity of 75 tons by the Ramsdell Co. A large force of men is now at work opening up the orebodies, and the extracted ore will be stored pending the completion of the mill. George W. Teagarden is superintendent. —— E. E. Grubb has located 20 lode claims and a tunnel site on Alpine Mtn., a hitherto somewhat neglected part of the Virginia City district. Denver mining men are said to be backing the enterprise. ——Charles Gilleen and Carl Johnson have recommenced driving the Hidden Treasure adit to exploit their group of 29 lode claims in East Argentine, near the Santiago mine. The adit is in 150 ft. —— Pat Walsh, who has been operating the Little Emma mine for the last three years, has encountered a foot of solid lead ore carrying 150 oz. silver per ton; $750,000 were taken from the upper workings many years ago.——Rees C. Vidlen has located the H. H. Pain tunnel site on Leavenworth Mtn. in connection with the Denver & Transcontinental Railway, the recent surveys for which show that by passing through this tunnel a considerable length of track will be saved. An air-compressor plant will shortly be erected and the work of driving commenced. —— Chas. Carlson, who has been prospecting the old Lucky Hesperus vein, has opened up 12 in. of ore that assays 300 oz. silver per ton.——B. J. O'Connell has secured a lease and bond on the Mendota mine, above Silver Plume. This mine is producing excellent lead-zinc ore, both smelting and concentrating. Mr. O'Connell will carry on extensive development work to open up new orebodies. —— Dan Williams, representing a Denver syndicate, has taken a bond and lease on the Mammoth property, near Silver Plume. There are large bodies of lead-zinc ore in the mine, which at present prices and with a modern mill can be made to pay. —— The first section of the Nashotah Co.'s mill on the Diamond property at Silver Plume is nearing completion, all the heavy machinery being now on the ground. It will have a capacity of 150 tons per day. The second section, having a similar capacity, will be erected early in 1907. —— Nelson & Kermode, leasing on the Gold Dirt property of the Empire Tunnel Co., have four feet of ore. The smelting ore has returned over three ounces gold per ton from recent shipments; the concentrate is worth $50 per ton. —— The Pioneer mine at Empire is also shipping ore, running 3 to 5 oz. gold per ton from a two-foot vein.

Georgetown, Dec. 21.

SUMMIT COUNTY.

(Special Correspondence).—The Abundance Co., which owns valuable ground on Mineral Hill in French Gulch, and which for some reason closed down the mine a few months ago, is about to resume work, and push on the main adit toward the centre of the hill. John G. Goodier, the general manager, has just returned from Kansas City, the home of the company, with this information. The property has developed valuable orebodies in its upper workings by shaft and drift-work, and it is well situated among the Union, Wellington, Oro, Mono, and other producers.——H. S. Clark, who has been manager of the Lanyon Zinc Co. for some years past, has resigned his position and the control of this company's affairs in Summit county will be in the hands of Benjamin B. Lawrence, who has accepted the position of Western manager for the Lanyon Co. Mr. Lawrence was for years connected with the Smuggler-Union mine at Telluride. Mr. Clark goes over to the Colorado Zinc Co.——The Silver King mine in Montezuma has been purchased by W. S. Leebrick and J. R. Roots of Idaho Springs. The property consists of several valuable claims, the principal of which is the Silver King, which has been worked for the past 30 years, and has a record of production of over $200,000.—The transfer also carries a concentration mill and the whole deal was closed for $20,000. The Silver King ores are principally silver, lead, and zinc.——Another important deal in the same section is that of the White Quail group on Cooper Mountain, which has been sold by Phillip Bianchi, Louis Dellamarte, and others to J. P. Simon of Superior, Wis., for $20,000. A company has been formed to work the property on a proper scale at once.——The Kokomo camp is enjoying a big boom and all available buildings are filled and new ones being erected.——The new machinery has arrived for the large mill at the Breene mine, and the work of installation will be started immediately.——The large concentrating and separating Wilfley mill is running at its full capacity and making large shipments of zinc and lead products. A rich strike of $200 ore was made last week on this property.——The big Vidler drainage and transportation tunnel which is being run through the Continental Divide at Argentine Pass, is being pushed along as fast as money and men can accomplish it. From Summit county side, the work is progressing at a rate of 250 to 300 ft. per month. On the other side about 200 ft. per month is being made. This work is not only opening up wonderfully rich mineral veins, but when completed will furnish a short road for connection between the Atlantic and Pacific slopes. If the present rate of progress is maintained the connection should be effected in about 12 months.



Breckenridge, Dec. 17.

TELLER COUNTY.

A rich strike has been made on the Four Brothers claim in the Agnes shaft now being operated by the Wabash Leasing Co. Cross-cutting has been in progress at a depth of 250 ft. south of the shaft for some time in search of a vein encountered at 150 ft. with the result that it was found early this week. Assays range as high as $1,060 per ton. The richest portion of the vein is a stringer from 10 in. to a foot wide, but ore is being broken four feet wide, and is expected to yield from three to four ounces of gold per ton. The mine is situated on the east slope of Beacon Hill.

NEVADA.

ESMERALDA COUNTY.

Owing to the strike of miners at Goldfied the Florence, Jumbo, Combination, Red Top, and Mohawk closed down on Friday, December 21. The remainder of the mines closed on December 23, the lessees stopping work on the following day. Everything in Goldfield is reported quiet at date of going to press, and no outbreak has taken place so far. Notice was served upon the mines mentioned, and the men quit work, some immediately and others at the end of their shift. There is hope of an early settlement. The only mining being done is on the Hayes-Monette and Frances Mohawk leases, and one lease on the St. Ives. Governor Sparks arrived at Tonopah Saturday morning, while he stated his arrival was in a private capacity, it is thought possible his presence may help toward a settlement.

HUMBOLDT COUNTY.

Excitement has been caused in the Seven Troughs district, 25 miles north of Lovelocks by a strike made on property owned by H. W. Knickerbocker and Bent Lloyd, within a quarter of a mile of the new town of Vernon. The vein is from seven to eight feet wide, and assays have run high. A large number of properties have changed hands in the district on the strength of this strike. Knickerbocker & Lloyd are opening up the vein as rapidly as possible and some high-grade ore is being sacked for shipment.——In the same district four big properties have already been developed extensively, and some ore has been accumulated. The best showing is being made by the Fairview, Owens, Moler, and Knickerbocker. The Seven Troughs district has favorable conditions for cheap and rapid extraction, and the proximity of the Southern Pacific railroad, which is within 25 miles, furnishes adequate transportation facilities.

LANDER COUNTY.

(Special Correspondence).—It is announced that the operations of the Gold Park Mining Co., at Gold Park, Nev., for the month ending December 10, 1906, were conducted at a profit of 24% on the total investment. The company is shipping ore steadily to the Salt Lake smelters, and is preparing to build a new 20-stamp mill in the spring.

Austin, Dec. 15.

NYE COUNTY.

The Fairview Co. at Round Mtn., will continue development work this winter, and block out as much ore as possible until it is practicable to build a new mill in the spring. The ore now on the dumps assays from $12 to $40 per ton. The adit is in 360 ft., and a raise beginning 60 ft. from the face of the tunnel has tapped the bottom of No. 1 shaft. From there drifts will run both ways on the exposed orebody. The vein is 14 ft. wide in good milling ore and no hanging wall has yet been encountered. In No. 2 shaft they are still driving on an 8-ft. lode of good milling ore.

The new camp of Duluth situated 48 miles north of Luning, in the northern corner of this county, is attracting much attention, although the original locations were only made last July. On the Climax, July, and Black Mule properties there are 26 sets of lessees, and all are said to have high-grade ore in sight. The Duluth Co. owns the Red Dog, Reno, and Reno Extension. A tunnel has been advanced 26 ft. on the Reno, disclosing a well-defined vein three feet wide. The outcrop on this property is 14 ft. wide and car-

ries ore rich both in gold and silver. On the Silent Friend, owned by Bruener & Co., a shaft has been sunk 68 ft. and in the bottom specimen gold ore is said to have been struck. On this property the vein outcrops the full length of the claim. The formation of the district is rhyolite, with later dikes traversing its length with a general strike east of north. Much of the quartz is green in color, but carries no copper. The new town of Duluth is five miles northeast of Lodi Tank, and 10 miles west from Ione. A pipe-line is to be run eight miles from the Shoshone range, which will furnish ample water.

LYON COUNTY.

Edward Clay and G. D. Johnstone have obtained possession of the old Crabbe mine near Yerington, and are pushing work. Large bodies of excellent ore have been opened up, samples from a vein in the Rockland, one of the Crabbe group, showing free gold. The hills surrounding Yerington are now covered with working miners, most of whom are finding ore.

OREGON.

GRANITE COUNTY.

Development work is to be started at once on the Oregon-Monarch claims adjoining the Red Boy mine near Granite. The Oregon-Monarch property is owned by Chicago capitalists, and comprises 11 claims located on the same vein as the Red Boy. Power for machine-drills will be obtained from the Red Boy compressor.——Eighteen inches of good ore have been opened up on the Golden Star claim situated near Granite and located on the same vein as the Magnolia and Independence. The ore was encountered in a drift which is being driven on the Magnolia lode. The Golden Star is owned by A. P. Jones and associates.——Arrangements have been completed for opening the lodes on the Katydid and Katydidn't claims on Magnolia Mtn., through the Snow Bird adit, which is near the dividing line of the two claims. The Snow Bird vein is rich in free gold, many thousand tons of ore from this vein having been run through the Magnolia mill during the past year that yielded a handsome profit.——A force of miners has been put to work in the long cross-cut at the St. Anthony mine near Alamo. Development operations will be continued through the winter until the claims are thoroughly opened. The St. Anthony Consolidated Co. owns 30 claims, upon which about $60,000 has been spent to date. Although the lodes have not been opened to any depth, there are excellent surface showings of free-gold-carrying ore.

WASHINGTON.

SPOKANE COUNTY.

A compressor plant and power-drills have been ordered for the Mohawk mine, west of Spokane. Much work has been done on the property during the last few years, but development work was slow and expensive, with only hand work available. Much good ore has already been encountered in the long lower adit, but the main body is beyond the present face of the workings. The Great Northern railroad now passes directly by the mouth of the adit, and the Nighthawk ore can be mined and put on the cars for shipment at a minimum cost.—— A strike of zinc occurring in three feet of gold-bearing ore was made on the W. & K. mine, 33 miles south of Spokane, a few days ago. The property is owned by H. N. Wentworth, of Spokane, and H. L. King, and Fred. King, of Connell. It has been opened by two 15-ft. shafts and by one 35 ft. deep, which have proved the vein for a length of 600 feet.

MEXICO.

CHIHUAHUA.

Chas. M. Schwab and associates of the San Toy Mining Co., have purchased the Central and Juarez mines in Santa Eulalia, for a consideration said to reach $1,000,000. The San Toy Co. is also negotiating for the purchase of the properties of the Santa Eulalia Exploration Co., including the Buena Tierra, Nueva Santa Eulalia, and others. It is stated that the price practically agreed upon is $1,250,000 gold, the original price asked being $1,500,000. The management of the San Toy Co., contemplates building a large smelter near Chihuahua for the reduction of its own ores and a general custom business. The company is now building an aerial tram from the Galeana and Bustillos mines to a spur of the Mexican Central railroad at the foot of the mountain west of Santa Eulalia. A second tram will be built connecting the company's newly acquired properties with the main line from the Galeana and Bustillos, enabling ore from all the mines to be carried over four miles of mountains from the mines to railroad for 15 cents per ton.

JALISCO.

Ore assaying 20,250 grams silver, 40 grams gold and 20% lead has been struck in the Santa Clara claim of the Santo Domingo group in the Hostotipaquillo district. Simultaneous with this discovery, the pay-streak of the Santa Clara vein widened to four feet. The adit is now in 251 ft. and two drifts are being driven. Recent development work has



Map of New Mexico.

disclosed rich ore in other portions of the Santo Domingo property. In addition to six adits and two drifts now being run, three new adits have been projected. A wagon-road will be built from the mines to Magdalena, in connection with which a cable road will be constructed from the top of the Santa Clara Mtn. to a point near the Santiago river to facilitate ore transportation.

SONORA.

A deal has been completed by which Thomas F. Cole, John Ryan and associates have acquired heavy interests in the Greene Consolidated Copper Co. Messrs. Cole, Ryan and Greene already have large interests in the Cananea Central Copper Co., and these two companies, controlling as they do practically the entire camp of Cananea, will be merged into a new corporation, to be known as the Greene Cananea Copper Co. Stock to the amount of $50,000,000 will be issued by this corporation, which will exchange this issue for Greene Consolidated upon the basis of $30,000,000 for the property, and for the stock of the Cananea Central upon the basis of $20,000,000 for this latter property. Cash has been provided for enlargement of plant and development. The new company will be incorporated under the laws of Minnesota, with nine directors representing the interests concerned.

It is understood that the Sonora Bonanza sale to the Guggenheims is at present considered off because of the refusal of a group of shareholders to come in on a pooling arrangement necessary in order to bring about the transfer of the property in the complete manner the prospective purchasers insist upon. Those standing out hold that the property has advanced to a point where its success is assured, and that parting with it under existing conditions is undesirable.

Personal.

E. N. VAN CORTLANDT is at New York.

WALTER M. BRODIE recently visited Prescott.

F. L. BOSQUI is on his way to Deadwood, South Dakota.

NORRIS ENGLISH has returned to Oakland from Mexico.

A. P. ROGERS is on his way to Colombia, to test dredging property.

M. VALENTINE is on his way from London to the northern Transvaal.

J. H. MEANS has returned from Mexico, on a visit to San Francisco.

LEO VON RONSEBERG is on his way from Prescott to New York.

HENRY F. LEFEVRE has returned to New York from Nicaragua.

ALFRED ALLEN has returned to Oakland from a season's work in Alaska.

F. N. RHODES is employed at the Calumet & Arizona mine, at Bisbee.

E. E. CARPENTER is assayer for the Tonopah Mining Co., at Tonopah, Nevada.

ROBERT BELCHER has come from Goldfield to spend the holidays in Berkeley.

W. S. GIFFORD is in charge of diamond-drill explorations near Stanford, Montana.

S. A. IONIDES is with the Penn-Wyoming Mining Co., at Encampment, Wyoming.

HENRY G. ADLER has been appointed general manager of the Foster mine at Cobalt.

ARTHUR J. RUSSELL, as managing director, is inspecting the Tolima mine in Colombia.

THEODORE BECKER is now chief assayer at the Garfield plant of the A. S. & R. Co., in Utah.

F. T. HAVARD, smelter manager for the Copiapo Mining Co., has returned to Chile from New York.

PHILLIP POORE is expected at the Barranca mines, in the Hermosillo district of Sonora, Mexico.

E. G. SPILSBURY is lying at the Nogales Hospital with a broken leg. He is recovering satisfactorily.

JOHN C. TREADWELL is now manager for the Coahuila Mining & Smelting Co., in Coahuila, Mexico.

C. HENRY THOMPSON, of the firm of Thompson & Gilliam, has left Los Angeles to inspect several mines in Mexico.

F. C. CARSTARPHEN has returned to Denver from Routt county, where he has been making examination of cement deposits.

LANE C. GILLIAM has been appointed manager of the Boca del Cobre mines, at San Luis del Cordero, in Durango, Mexico.

RICHARD A. PARKER, having visited British Columbia, Idaho, and Mexico, is on his way from Denver to Boston, to see his clients.

A. W. WARWICK, consulting engineer to the Sierra Madre Development Co., has returned to Denver from a long trip in Mexico.

GODFREY D. DOVETON, of Doveton & Purington, is at the Esperanza mine, El Oro, Mexico, conducting a metallurgical examination.

ROSCOE H. CHANNING, JR., has resigned as general manager for the Utah Consolidated Co., and will be president of the Cerro de Pasco Mining Co., in Peru.

PHILIP ARGALL has been appointed consulting engineer to Stratton's Independence, Ltd., to fill the vacancy caused by the resignation of GEORGE A. SCHROTER.

JOHN C. TREADWELL has resigned as manager of the Sahuayacan Mining Co., to take a like position with the Coahuila Mining & Smelting Co., at Viesca, Coahuila, Mexico.

C. COLCOCK JONES is in Arizona for several weeks examining mining properties in the Superstition and Bradshaw mountains, and will return to Los Angeles at the end of December.

L. W. TRUMBULL, of Laramie, Wyo., is examining mineral properties in Gunnison and Chaffee counties, Colo. Shortly after his return from Colorado he will make a short trip to Sierra county, California.

FRANK C. LORING has resigned as general manager for the Trethewey Silver-Cobalt Mine, Ltd., at Cobalt, Ontario, but he remains consulting engineer. He will engage in a general consulting practice.

C. M. FUELLER, formerly at 1750 California St., Denver, has moved to 221 Empire Bdg., and in future will do a general consulting engineering and examination practice. Mr. Fueller has been appointed consulting engineer of three large companies in Colorado and Utah.

Obituary.

J. MORGAN TAYLOR, a mining man known from Nome to South America, died at Sacramento on December 20. He left Goldfield for Lodi, Cal., early on the morning of that date, and was taken ill with pneumonia on the way. Upon arrival at Sacramento, friends who were on the same train, telephoned for an ambulance, and sent him to the Sister's Hospital, where he died in the afternoon. Relatives of the deceased at Lodi were notified and the remains were expressed to that city and interred on December 24.

Latest Market Reports.

PRINCIPAL QUOTATIONS FOR MINES.
San Francisco and Oakland, December 27.

Argonaut	$4.70	Furnace Creek	$5.50
Con. Virginia	1.22	Savage	1.05
Mexican	0.95	Sierra Nevada	0.75
Ophir	3.20	Yellow Jacket	1.75
Belmont	6.00	Montana	3.95
Jim Butler	1.30	Mohawk	13.25
Jumbo	3.55	Red Top	3.50
Jumping Jack	0.52	Sandstorm	0.69
Manhattan Con	1.00	Silver Pick	1.42
Midway	2.35	Tonopah Ex	5.70

ANGLO-AMERICAN SHARES.
Cabled from London.

	December 20. £ s. d.	December 27. £ s. d.
Camp Bird	1 8 3	1 8 6
El Oro	1 6 9	1 5 0
Esperanza	2 11 0	2 15 0
Dolores	1 7 6	1 6 3
Jumping Jack	1 0 3	1 0 9
Stratton's Independence	0 3 6	0 3 3
Tomboy	1 12 6	1 11 9

(By courtesy of W. P. Bonbright & Co., 24 Broad St., New York.)

METAL PRICES.
By wire from New York.

	Closing Prices December 20.	Closing Prices December 27.
Copper—Lake (cents per lb)	23.23@23.40	23.70 @23.95
" Electrolytic "	22.79@23.04	.15 @23.50
" Casting "	22⅞	22⅞ @23
Lead "	6	6
Spelter "	6.58@6.63	6.65
Silver (cents per oz.)	68⅝	69½

CURB QUOTATIONS—NEW YORK.

	Closing Prices Dec. 20.	Dec. 27.
Bingham Central	1¾	1⅞
Boston Copper	30½	31
Calumet & Arizona	164	170
Cumberland Ely	11⅞	12¼
Dolores	8¼	7¾
El Rayo	6½	6½
Guanajuato Con	4⅞	4⅞
Giroux Con	9½	9½
Greene Con	31¼	33
Nevada Con	17⅞	18⅛
Nipissing	13¼	12⅛
Tennessee Copper	47½	48¼
Tonopah Ex	5⅞	6¼
Tonopah-Belmont	6½	6
Tonopah	20	20⅛
United Copper	71	70⅞
Utah Copper	32	30¾

(By courtesy of Hayden, Stone & Co., 25 Broad St., N. Y.)

Concentrates.

Most of these are in reply to questions received by mail. Our readers are invited to ask questions and give information dealing with the practice of mining, milling, and smelting.

THE lining for by-product coke ovens should be made of fire-brick high in silica, whereas that for a rotary cement kiln should be high in alumina.

THE gold lodes of the Appalachian region, from Nova Scotia to Alabama, are in quartzites, slates, schists, and gneisses of either Cambrian or Algonkian age.

THE antimonial lead, which is an undesirable by-product in lead smelting, is used in making coffin handles. The purer forms of antimony, free from arsenic and lead, are used in manufacturing type and babbitt metal.

MOLYBDENITE, which is often mistaken for graphite, is the sulphide of molybdenum. The demand for it has increased on account of the discovery, comparatively recent, that it gives very beneficial properties to steel.

ONE of the causes of loss in the transmission of compressed air is pumping the air of the engine room rather than that drawn from a cooler place. The loss amounts to from 2 to 10 per cent.

WHEN mercury is sub-divided minutely, as in stamp-milling, it is said to be 'floured'; when the globules become coated with grease, fine slime, manganese oxide, etc., so that they will not coalesce, the mercury is said to be 'sickened'.

COMPARATIVELY little has been heard about radium this year, due to the fact that the cost of the salt is almost prohibitive, and that the experiments to date, while interesting, have proved little or nothing as to the actual value of the element.

A RECENT British consular report states that the Ain-Smara mines, situated 11 miles from Constantine, contain rich lodes of chlorophosphate of lead. Other beds of carbonate of lead have recently been discovered near Batna, but so far have remained unworked.

THE difficulty encountered in applying electricity to hoisting is due to the trouble of satisfactorily connecting motors to the existing drum. Electric hoisting is not only economical, but is simple of control, and the motors afford a uniform torque, which lessens the fly-wheel effect of the winding engine.

THEORETICALLY, a miner working underground requires only 6½ cubic feet of fresh air per minute for respiration, the absorption of moisture, and the dilution of carbonic acid gas. This, however, assumes that all air after having been breathed is immediately removed, without mixing with the surrounding atmosphere, a condition impossible to fulfill.

MICA is used chiefly in electrical machinery, as an insulator between the segments of commutators. For this purpose the mica must be soft. The General Electric Company gets its mica from its own mine near Sydenham, in Ontario. Large sheets of mica are in demand for lamp chimneys and other novelties. Scrap mica is ground fine for fire-proofing material, as a lubricant, and for wall papers.

MANY mining engineers have disputed the superiority of the compound engine for winding, owing to its short runs and frequent stoppages, and the large proportion of its power taken up in accelerating the load. It is possible, however, to install a four-cylinder compound engine of sufficient power to dispense with any live steam in the low-pressure cylinders, which latter condition is seemingly the cause of much of the inefficiency of most existing compound engines.

IN regard to operating a dredge in cold regions, the Conrey Placer Mining Co. works in the winter at Ruby, Montana, where for several months the temperature is 20° below zero. They are enabled to work in the winter by building a dam around an area of ground sufficient to equal the capacity of the dredge during the cold weather. The effect of submerging the gravel is to keep it soft. The washing is done in sluices on a barge, the sluices being enclosed and kept warm with steam.

ACCORDING to Chas. G. Yale, of the U. S. Geological Survey, in his report on the output of borax during 1905, the production of that mineral is almost entirely confined to the State of California, and to the counties of San Bernardino, Inyo, and Ventura. Only small quantities are occasionally taken from the marshes in Nevada, where a little work is carried on during the summer months. The total output of crude borax for the year 1905 was 46,334 short tons, as against 45,647 tons in 1904.

PIPES supplying air to rock-drills should be of a size to permit the passage of air at a velocity not greater than 25 to 30 ft. per sec., while all bends and angles (especially short ones) should be avoided, as they add greatly to the friction of the air, and thus decrease the pressure. The friction of the air is proportional directly to the length of the pipe, and to the square of its velocity. For this service, pipes up to 5 in. diameter are provided with couplings, above that with flanged joints made up with gaskets. Great care must be taken that these joints are perfectly tight, as the loss, even from a pin-hole, is considerable.

IN the manufacture of cyanide, ammonia, as a nitrogenous material, is combined with carbon so as to form sulphocyanide as an intermediate product. This is converted to cyanide by the oxidation of the sulphur to sulphuric anhydride. Nitric acid is used. The sulphocyanide is decomposed and the nitric acid is recovered. The operation takes place in a series of earthenware jars connected with each other; they are fitted with an exit pipe for the gases and an inlet pipe for the steam that heats and agitates the contents. The first jar is furnished with inlets for the sulphocyanide and nitre solutions, for vitriol, and for the return of the recovered nitric acid. The second jar is fitted to receive the water and to dissolve the hydrocyanic acid returned from the condensing apparatus.

WHERE compressed air is used, it is important that all joints in the air mains should be carefully made to prevent any possible leaks, as air leaks are more expensive than steam leaks. At intervals it is well to test for leaks by allowing the air at full pressure to remain in the pipe long enough to observe the gauge. To render pipes accessible for inspection, they should, if buried, be carried in boxes sunk just below the surface of the ground, and all low points which might form pockets for the accumulation of entrained water should be avoided, as they obstruct the passage of the air. It is also advisable, in long, uneven lines, to provide an opening near the end, for occasionally blowing out water. Long lengths of pipes on the surface or shafts where the temperature is subject to changes, should be provided with expansion joints.

Discussion.

Readers of the MINING AND SCIENTIFIC PRESS are invited to use this department for the discussion of technical and other matters pertaining to mining and metallurgy.

The Need of Experience.

The Editor:

Sir—Are you not hard upon the young mining graduates mentioned by E. D. C. in your issue of December 1? An expert millman yourself, you hardly realize that so evident a piece of knowledge as the care of amalgamated plates can escape the attention of a mining graduate. In his college course the steps of a chemical analysis, the demonstration of the mathematical properties of asymtotes, the system of crystallization to which a mineral belongs, are as all-important to him as the dressing and care of plates. He learns without discrimination, crams for examination, and forgets as rapidly as possible a large part of the knowledge both useful and useless thus acquired. I would venture to say, however, that our men who take our instruction involving practice work in ore-dressing learn by actual experience the care of amalgamated plates in a way which they do not forget. On graduation most men have not acquired the habit of study, and accordingly do not read up especially where, as in this case, the matter seems self-evident, and accordingly it seems severe to call them 'chumps.'

In the account of the clean-up one can hardly understand how it would be possible to clean and squeeze the amalgam, and yet leave it no metal which, upon retorting, would not give considerable residue.

L. S. AUSTIN.

Houghton, Michigan, December 12.

Black Sand.

The Editor:

Sir—Your editorial remarks concerning Dr. Day's work on 'black sand' are much to the point. The gentleman is no doubt doing over again much that has been done before, but there is the hope that he will do it better, and the almost certainty that his results, failures as well as successes, will be published to the enrichment of a subject that possesses but a scanty literature. Beach or black sand has been exploited for gold and for steel for many years. Twenty years have passed since I saw samples of steel made from the magnetite winnowed from the sand hills in San Francisco itself, and heard of the formation of a company which was to go into this manufacture on a great scale. Even before that time I had examined for clients certain deposits along the coast of southern Oregon, and I may mention incidentally that my conclusion as to their workability was that the only obstacle was the lack of gold—steel not being an object with us. This conclusion I still believe to be sound. Nevertheless, the metallurgy of such materials has made advance enough of late years to give some hope and even expectation that the time may soon come when a number of those deposits may be successfully worked, either for steel or for gold, or for both. Magnetic concentration increases the chances, for by this means the iron content can undoubtedly be got in a comparatively pure condition; and the cyanide process, if it meet the claims of some of its advocates in this direction, is likely to be instrumental in gaining the gold of the richer sand. But some will say that there is no rich sand; and in this I agree, if we limit ourselves to the material along the sea coast in general, and along such streams as the Snake river, for it is rare indeed that the assay shows more than a dollar per ton, while great areas carry only a few cents per yard. Those accidental happenings mentioned by the newspapers, where great amounts of gold are reported, I think must be wholly fictitious, in so far as the class of beach and river sands are concerned. They are most probably, if true at all, the results of the clean-up from some placer washing, and are therefore outside of the subject in hand. I hope that investors will not be led into this industry from exaggerated ideas of the wealth of these deposits, for they are, with the exception of some few restricted areas where conditions have favored the concentration of the gold, quite poor in that metal, whatever be their content of magnetic iron. I have myself made many assays—some hundreds, I presume—and my recollection is that I never got as much as ten dollars per ton in any case when operating on the natural sand, that is, sand which had not been artificially concentrated or winnowed, to raise its value. I have heard the opinion advanced by the beach miners of Coos and Curry counties in Oregon, where the working of such deposits has been long a recognized industry, that ten cents per yard would satisfy them, and that they did not think that the average contents of any large area of workable sand was more than half that. With this view the results of my assays forced me to coincide.

HERBERT LANG.

Oakland, December 4.

California Place Names.

The Editor:

Sir—The duties of a mining engineer are numerous and diverse. Some are plainly evident, others are not so. In fact, some are not recognized as duties in any sense. In this day and generation, when all lines of human activity, while preserving inviolate their individuality, still draw closer together, the mining man, in common with the other workers, finds at hand more and greater work to be done. What yesterday failed to attract his attention becomes today a small bit of work necessary for him to do. Thus we are slowly reaching a higher level of society. There is one small bit of necessary work which appeals to me strongly as being particularly within the province of the mining engineer to aid in accomplishing. This is the preservation of the old California place names.

Our place names have more than the mere worth of attached sentiment, great as this is; they also represent one of the strongest bonds uniting present with past, urging us on to greater and greater endeavors to perfect in all ways the future. Although we, as a people, do not yet adequately realize their full significance and value, each year serves greatly to increase this true realization. If we of today fail to preserve the old landmarks and milestones of progress, we shall be held to blame by posterity.

The early history of California deals with the hard work of founding a commonwealth, of labor in the mines, and on the great plains. The records of this have been preserved in the names of the various geographical and topographical points, of towns, and of all the other features of the country needing specific titles. The preservation of all these rests upon those among us who not only comprehend their full meaning, but who also are personally familiar with the places or things named. There have been a very few effectual, though desultory, movements in the State to preserve certain place names, but wide-spread attention to the subject is greatly needed, else we shall soon lose what never can be regained.

Of all men whose duties call them from the town to the mountain, from the atmosphere of intellectual growth to the fields of hard labor, the mining engineer and geologist stand pre-eminent. For this reason these men can and should help to keep the old names in their original purity, not only by using them correctly in speaking and writing, but also by spreading broadcast a

better appreciation of all for which they stand. The famous old mining town of Murphy's Camp is a good case in point. The popular tendency to shorten everything has reduced the name to plain Murphy — utterly bereft of both meaning and charm. Another instance of this gradual loss is found in a recent change in the name of the railroad station at the old mining camp at Shady Run to Midas. One has but to glance out of the car window here to realize the peculiar appropriateness of the original.

Again, at the famous scenic point just above Colfax, where the railroad rounds a sharp curve many hundred feet above the American river, the old and significant title of Cape Horn has been altered on the railroad schedules to Caporn. We need place names, need them more every day as we travel further and further from the olden times when the foundations of our State were laid. Therefore it is urged upon all mining men that they do their share intelligently both to preserve these names and to widen the general knowledge of their ultimate meanings.

JOHN A. REID.

Stockton, December 13.

Cyanide Practice at Kalgoorlie.

The Editor:

Sir—With reference to Mr. Brett's long letter in your issue of December 22, of which you kindly sent me an advance proof, I notice that in spite of the space at his command Mr. Brett does not apparently deny my suggestion that in his so-called tube-mill versus pan tests he actually fed into the tube-mill with the sand to be re-ground more slimed (finished) product than sand to be re-ground, although he must have known that such a procedure would seriously diminish the duty of the tube-mill.

As Mr. Brett does not deny this, his long personal explanation calls for no other comment from me; but I would like to add that the pan work at the Ivanhoe has impressed me so favorably that were I laying down an installation of pans I should deem myself fortunate if able to secure the services of Mr. Brett for this purpose—so efficiently have the pans been worked at his late mill at Kalgoorlie.

ALFRED JAMES.

London, December 5.

Transport Under Difficulties.

The Editor:

Sir—General managers sometimes make mistakes. As a result of an error by the respected manager of the Mazapil Copper Co. at Concepcion del Oro, Mexico, in giving an order to the Allis-Chalmers Co. for a rock-crusher, the writer is enabled to give an account of an engineering feat which he believes will be interesting to the readers of this journal.

Some time ago our management decided, wherever possible, to adopt labor-saving devices. One of the first steps taken was to do away with hand-sorting of the copper ore as it came out of the mine; a crusher of the Blake type was available, but it was found, after a time, to be of insufficient capacity. After seeing the economic benefits to be derived from the new system, it was decided to order a machine of a larger size, 15 by 9 in., but in sending off the order it was not mentioned that the crusher should be a sectional, for this was necessary on account of the absence of any proper road between the railway and the mines. The latter are situated at an altitude of 2,000 ft. above the terminus of the former, the distance between the two points being three miles.



A Crusher in Mid-air.



Mexicans Working a Crab.

The crusher arrived and after dismantling it as much as possible, we found that the main casting weighed about five tons; a very strong cart was made and by repairing the road a little, the machine was ultimately landed at a point where it was scarcely possible, excepting at tremendous expense, to proceed any further with the cart. An aerial tramway was then decided upon, the construction of it being entrusted to the superintendent of the over-head ropeways belonging to the company, an energetic, intelligent Mexican. First, an especially strongly constructed discharge station was erected, and from this two one-inch steel ropes of the best English make were carried over the bed of the river and on to a point at the top of the mountain. The horizontal distance between the discharging and receiving stations is about 510 metres (1,673 ft.) and the elevation is 250 metres (820 ft.). At the discharge terminal of the ropeway, a strong bent was built; over this the cable passed, the ends being anchored around large rocks and securely clamped.

The crusher was slung on the two guide-ropes by the ordinary kind of transportation carriers, two wheels inside two flat-iron discs, securely clamped together; the

pulling rope, which was worked by a strong crab turned by a few Mexican laborers, was of one-inch diameter and of the same make as the guide-ropes. The speed of hoisting was necessarily very slow, but the casting was landed on top of the mountain in one ordinary working day. From the discharge station to the site of the crusher, the road was fairly even and the work of completing the transfer was easily accomplished. While there was the extra cost of transport due to having the crusher shipped in one casting; on the other hand, there would be the maker's extra charge for supplying the machine in sections, and, as anyone knows, the stability of the crusher is fully established in the former case; in a word, a general manager's apparent mistake; by the use of sound intelligence and a determination to surmount trouble, will prove to have been for the better.

I am indebted to Mr. Chester-Master for the photograph of the crusher in mid-air. As can be seen, the crusher was shipped over the cable together with the wagon on which it was transported from the railway station.

JOHN COOPER,

Gen. Supt. of Mines, The Mazapil Copper Co.

Concepcion del Oro, November 12.

GRIFFITHS, referring to the work of Strutt and Rutherford, and assuming the earth to be in thermal equilibrium, states even if the whole of this interior heat be due to radium alone, the mean quantity per cubic centimetre can not exceed 1.75 by 10^{-13} gram. The conclusion of Rutherford, based on somewhat different values for the constants involved, gives an equivalent of 1.52 by 10^{-13}, while Strutt has found that poorest igneous rock he examined (Greenland basalt) contains more than ten times this quantity, and an average rock 50 to 60 times the amount. The assumption that the earth is cooling only aggravates the difficulty, and facts appear to tell against the theory that it is getting hotter. Also we must take into consideration the heat due to the existence of uranium, thorium, etc. He concludes that either the rate of heat production by radium diminishes as we approach the centre of the earth, or the interior of the earth differs markedly in constitution from the exterior crust. Mr. Strutt, arguing from known data, assumes the maximum temperature at the bottom of a crust or about 45 miles in thickness is in the neighborhood of 1,530° C. Such a crust would contain about 1/30 of the earth's volume, and assuming that throughout this crust the radiant heat energy were of the average of that exhibited by many samples examined by Strutt, then the temperature of the earth could be maintained until our stores of uranium suffered sensible depletion.

METALLIC TELLURIUM is extracted from the slime which is the waste product of the electrolytic process employed at the Baltimore copper works in the treatment of copper-mattes from the West. This residue, after the removal of silver and copper, consists principally of the sodium salts of silica, selenous, and tellurous acids, the last named being in large excess. The method consists in the precipitation of the metal and its conversion into basic tellurium nitrate. This finely crystallized salt serves as an excellent means of obtaining pure tellurium. The basic nitrate is decomposed by heat; the oxide thus obtained is dissolved in hydrochloric acid; and from this solution the metal is re-precipitated by means of sulphur dioxide. Crystallization of the basic nitrate from a nitric acid solution removes selenium completely from the tellurium, and also furnishes a convenient method for the separation of other metals.

Two Special Alaskan Maps.

Two special maps of the Nome region, Alaska, recently made by topographers of the United States Geological Survey will be welcome to the many people interested in that rich and growing district. Ever since the discovery of gold placers on the Seward Peninsula in 1898 that general area has been as attractive to the public as was the Klondike in the spring of the previous year. Miners, operators, and investors have flocked into that part of Alaska and numerous towns have sprung up. The chief of these, in fact the metropolis of the north, is Nome. From a rough mining camp it has been rapidly transformed to a corporate city, with its own government and most of the modern improvements and facilities that are found in cities of equal size in the States.

A peculiar feature of the placers which have made Nome famous is the occurrence of beach deposits. These extend along the shore of Bering Sea in front of the present location of Nome for a distance of twenty miles. The value of the gold taken from these beach placers is estimated at no less than $1,000,000, but this is small compared with the value of the gold taken from the nearby creek and bench claims, which have already produced $30,000,000 and are still adding to the world's wealth of yellow metal.

The importance of this region was early manifest. In 1899 the United States Geological Survey made a geologic and topographic reconnaissance of the southern part of the Seward Peninsula. The data and maps published as a result of this expedition furnished valuable information to miners and investors, especially in regard to roads, ditches, available sources of water supply, and other features that are important in the economic development of mines. These maps lack, however, the details that are essential in maps used for such engineering purposes as making preliminary estimates, laying out grades and locations for future construction, etc., and it was to furnish additional data that a more detailed map of this region was made. It is published in two sheets, called the Nome and Grand Central specials.

The Nome special includes the area lying between 64 deg. 25 min. and 64 deg. 40 min. lat. and 165 deg. and 165 deg. 30 min. long. The Grand Central Special includes the area between 64 deg. 40 min. and 65 deg. lat. and 165 deg. and 165 deg. 30 min. long. These sheets are published on a scale of 1:62,500, approximately one inch to the mile, with a contour interval of 25 ft. referred to mean sea-level as a datum. The area embodied in these two sheets contains most of the placers in the Nome region, also the streams and their sources from which the operator takes water to sluice out his gold and on which he is absolutely dependent. From the elevations and other data shown on these maps the making of preliminary estimates of distances, grades, and locations for ditches, roads, water-power, and other construction work will be much facilitated.

THE value of zinc ore depends largely upon the presence of impurities, especially iron, manganese, and lime, which increase the corrosion of the retorts, and lead, arsenic, and antimony, which contaminate the spelter. The value of the ore is also affected by its character, whether oxidized or sulphide, or a mixture of both, the sulphide ore must be roasted, but yields a diminished weight for the subsequent treatment, which is the most expensive part of the process; the oxidized ore escapes preliminary treatment, unless it be carbonate, but suffers no diminution in weight. The preliminary treatment of ores which are mixtures of sulphides and oxides is often troublesome.

Primitive Methods.

The accompanying photographs we owe to the courtesy of Mr. Frank E. Shepard, of the Denver Engineering Works. They illustrate some quaint devices still employed in a remote part of Mexico.

Fig. 1 shows the rollers and buckets of a rudimentary tramway. The cable is made of six No. 9 telegraph wires—probably stolen. The buckets are 5-gal. oil-cans tied fast to the cable. When the tram is running it requires a man at each roller to lift the buckets over; the tram is about 800 ft. long and has about a 25% incline. If the tram starts to run away the boss calls down the line to stop the buckets and the whole thing becomes arrested on account of the buckets getting mixed up with the rollers.



Fig. 1. Rudimentary Tram.



Fig. 2. Bridge Built of Vines.

Fig. 2 illustrates the use of vines in making a bridge at Atoyoquillo. No iron, wire, rope, or hide is used in this construction. The material all grew close to where the bridge was built. Mr. W. H. Holcomb, on the bridge, weighs 230 lb. The span is about 150 ft.; the height above water is 16 feet.

Fig. 3 shows a water-power hammer. This hammer strikes about 90 blows per minute and all the machinery was made on the ground.

Fig. 4 represents the iron works at San Raphae under the *pueblo* of Itundujia. In this place about 1,000 lb. iron ore is reduced per day of 10 hours in an open fire with charcoal as fuel. Blast is supplied from a water-blower in which the water which carries entrained air is given a fall of about 15 ft.; the air is separated into a receiver built of stone and is led through a stone pipe to the forge. The iron melts out of the ore and collects in the bottom of the forge; a cold bar about 1½ in. diam. is inserted into the molten mass and turned until it collects enough for a bar; it is then hammered out by a water-power hammer. From the time the ore is put on the fire until it is in the form of a bar does not exceed 30 minutes. The material produced is about the same grade as the Swedish iron imported into the United States. To mine the ore and make the iron costs less than two *centavos* per pound finished. The waterfall to the right of the picture is 40 metres vertical.



Fig. 3. Water-power Hammer.



Fig. 4. Old Iron Works.

THERE are two districts in Kentucky where zinc and lead occur. That lying in the western part of the State is now producing small quantities of ore in connection with the mining of fluorspar. In central Kentucky, near Lexington, there is also an area where zinc and lead occur, though very little has been produced.

A New Cyanide Plant.

Written for the MINING AND SCIENTIFIC PRESS
By MARK R. LAMB.

With the introduction of an economical method of washing slime, the cyanide process has undergone a decided change.

Formerly it was the aim to make as little slime as possible, because, although the actual extraction by the solution was better from slime than from sand, the separation of this solution from the slime was slow, expensive, and unsatisfactory. With one of the recently perfected vacuum-filters in mind, however, the designing engineer now plans to grind fine, or slime the entire product of the mill. The accompanying drawing exhibits the design of a plant to treat ores which run about as follows:

Gold	$60 per ton
Silver	None
Concentrate	5%
Free gold	5%
Lime required to neutralize	10 lb.
Cyanide consumed per ton	1.2 lb.
Concentrate worth	$400

The ore is rather softer than ordinary California gold-bearing quartz. This plant is designed along the new lines and is expected to treat 140 tons per day, crushing to a maximum of 150 mesh. The crusher, a gyrator, is not shown. The ore will be fed to the stamps of a size not exceeding one and one-half inches. The stamps will weigh 1,600 lb. The mortars will be very narrow, with no arrangements for inside amalgamation. Each stamp is expected to crush 7 tons through 10-mesh in two hours. This result is being attained with stamps of similar weight on ores of approximately the same hardness.

Stamps weighing 1,600 lb. may seem too heavy. The cam-shaft will be 7.5 in. diam. with five stamps to a shaft. The preponderance of weight will be in the boss-head, which will be 9.5 in. diam. Stems will be 4 in. diam. and are not expected to break. This may also be considered heresy, but 30 stamps weighing 1,450 lb. with 3.5 in. stems have now run nearly a year without breaking a stem. The mortar foundation will be of concrete and very broad. Muntz metal apron-plates are shown, as these have a life in cyanide solution approximating four times that of copper. It is more than likely that plates will not be used, as what free gold is in the ore is very fine and will dissolve promptly.

Cone classifiers are shown below the battery-plates, for roughly separating sand from slime before concentration on vanners. The tailing from the vanners goes to a large de-watering cone, the underflow from which goes to tube-mills for re-grinding. For this particular work, a Dorr classifier will probably be installed instead of the cones, as the sand can be sent to the mill with much less water, which condition is much better for efficient work in the tubes. The Dorr classifier will require practically no attention as compared with a cone.

The tube-mills are to be 4 ft. diam. by 12 ft. long and lined with soft iron plates 1 by 8 in. by 12 ft., the joints covered with 3-in. angle iron, 12 ft. long. It is expected that this lining will last 12 months. From the tube-mills the pulp will go to cones, or a Dorr classifier, the oversize returning to the tubes and the slime to the 6-ft. thickening-cone before concentration. It was hoped that slime-tables would be satisfactory for concentration at this stage, but experiments now being made point to a return to the canvas plant as the only means of extracting all the mineral.

This last concentration is the vital point of the process, as any mineral going over with the slime to the cyanide plant will carry all its value to the waste dump.

A canvas plant for such a tonnage will cover a large area, since using a 10-ft. width per ton of dry pulp as a basis of calculation, a figure recommended by Mr. A. G. Kirby, there would be required a distribution length of 1,400 ft. with a width of canvas of at least ten feet. If placed on two floors, the space required in the mill will be 17,000 sq. ft., or about three times the area now covered by the slime-tables in the plan. It was the intention to concentrate about one-third of the pulp, taking this quantity from the bottom of the 6-ft. cone, but it will probably be found necessary to concentrate the entire product over canvas.

The remainder of the plant is simple and consists of settlers, agitators (equipped with compressed air for aeration), a slime-storage vat (whence the slime is taken to the vacuum-filter for washing). The overflow from the settlers and part of the overflow from the filter is sent to the battery-sump and pumped from there to the battery-supply vat, not shown in the drawing.

The solution drawn through the filter passes through a clarifying press on its way to 'strong' and 'weak' gold vats. From these vats it is pumped through a Merrill's zinc-dust precipitation press and returned to the battery-sump. The slime cake is washed first with battery-sump solution and then with water, enough of the latter being used to make up for evaporation loss and loss as moisture in residue.

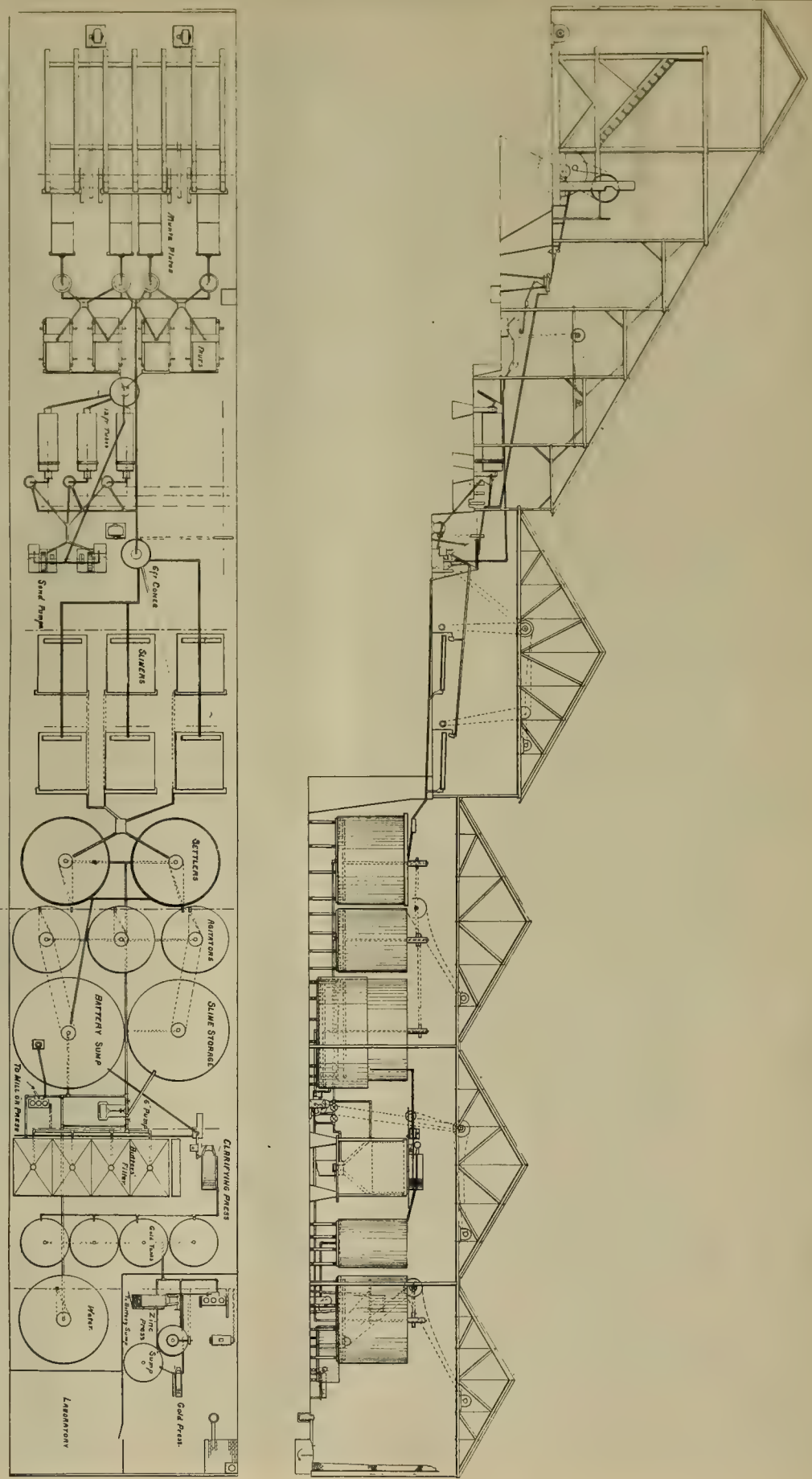
The labor in this mill to consist of one battery man, one concentrator and tube man, one canvas man, and one cyanide man, together with superintendence, will cost about $77 per day or 55 cents per ton milled When the mill is increased to 40 stamps, the labor will be increased by one battery helper and one canvas man per shift, making a total of 36 cents per ton milled.

The slime-plant can be increased largely without increasing the labor required. The slime is transferred from the settlers to the agitators, from these to the filter and discharged from the latter by merely a change of valve settings. Precipitation is effected without the labor required when zinc shavings are used and is quite as complete. As the milling will take place in a dilute cyanide solution, a large part of the extraction will be attained before the pulp reaches the agitators. The battery solution will be kept at a strength of about one pound per ton, the necessary additions of cyanide being made to each charge in the agitators. Enough solution from the battery-sump will be precipitated to keep the value of the circulation solution as low as seems desirable.

The floor of the entire mill will be of cement set with a good grade and will drain into a sump (not shown) in the slime-room. The cost of this plant will be actually less than a sand and slime plant of the same capacity, using decantation and percolation. Labor will be much less, water loss less, extraction better, floor space (and consequently heating expense) less, and power slightly more.

The estimate of power required reaches 200 h.p. It is expected that an extraction of at least 95% will be attained in gold ores averaging $60 per ton. Total working costs with 20 stamps will be well under $2.50 per ton and with 40 stamps it is expected that the cost will be less than two dollars per ton.

SUCCESSION OF MINERAL PRECIPITATION.—In the ores of Cobalt, Ontario, it has been ascertained that the smaltite (arsenide of cobalt) was deposited first, closely followed by the niccolite (nickel arsenide); other minerals in small amount were laid down at this time. Then after a period of slight movement, in which the first minerals were more or less fractured, calcite was deposited as a groundmass. Later came argentite (silver sulphide), which was followed by native silver and native bismuth. Lastly came the surface decomposition products erythrite (cobalt bloom), and annabergite (nickel arsenate).—W. Campbell and C. W. Knight, in *Economic Geology*.



Plan and Elevation of a New Cyanide Plant.

Legends of the Desert.

Written for the MINING AND SCIENTIFIC PRESS
By W. H. STORMS.

No portion of the mining region of the West possesses such fascination for the prospector and adventurer as that vast domain lying between the Rocky Mountains and the Sierra Nevada, and southward to the Mexican border. It equals an empire in extent, and though actually a desert, in all that this severe term implies, it supports many thousands of people who lead an active and happy existence, and who derive not only a livelihood, but generally much more — often a fortune — from the wonderful resources of this sterile and little-known land.

Ever since the days of '49, stories of the marvelous wealth of the desert have been carried into the settlements along its border, and into the cities of the Pacific coast. These stories have, in many instances, been the chief, if not the only incentive for men—yes, and women too—to risk their lives on the burning sands of the waterless valleys and amid the rocks of the wind-swept ridges. So full of reality, and promise of fortune are some of these legends of the desert, that it seems little wonder if prospectors are willing to take any risk in the hope of sudden, and comparatively easy, fortune. Each of these remarkable tales describes the finding of wonderfully rich gold rock, or possibly of silver ore, but the finder, for various reasons, was able in each instance to carry away only a few pounds, at most, of the gold-matted quartz, or silver ore, but almost without exception it was a deplorable fact that they were never again able to find the place where the original discovery had been made.

Without doubt these oft-told tales are in a great measure responsible for the discovery and development of many desert mines. Prospectors, upon hearing for the first time one of these fairy tales, would start at the first opportunity in quest of the illusive wealth, and it is a sad fact that to these same stories is due the sacrifice of many adventurous lives, which might have been utilized to better advantage.

One of the most frequently repeated of these extravagant yarns is that of the 'Pegleg' Smith mine. Smith was a frontiersman and squaw man, who had lost a leg in one of his many scrimmages and had substituted a wooden leg for the lost member. He was widely known 50 years ago, in the Southwest, in Arizona and southern California. Although crippled, 'Pegleg,' as he was called, feared not to tackle the desert alone and single-handed. On a certain memorable occasion, so the story goes, being at Fort Yuma or in that vicinity, on the banks of the Colorado river, and wishing to visit Los Angeles, he started with his saddle horse and pack animals across that terrible reach of desolation and death known as the Colorado desert. A sort of road, or trail, was followed by the west-bound pilgrims of those days who chanced to be that far south. This was known as the Butterfield trail. It was partly in Mexico and partly in California. The fact that there was a road, over which hundreds of men, women and children, in wagons, on horse-back, on foot, had traveled, suggests that the trip across the desert, about 120 miles, to the mountains on the west side of the valley, could not be a difficult or particularly dangerous undertaking. Such, however, was, at that time the case, nor is it very much better now. Terrific wind-storms sweep across those plains, obliterating all signs of any roadway that may have existed a few hours before. The coarse sand and small pebbles are driven like chaff before the gale, and good-sized sand dunes are moved from one point to another or are so modified in shape as to be unrecognizable by one who had observed them the previous day. Water, too, is woefully scarce. There were a few water-holes and springs on the route at that time; of these, Indian Wells was the largest and best known.

Pegleg was well acquainted with the desert and its perils, but undaunted he started for Los Angeles over Warner's Pass, and Temecula cañon—almost a direct line. He estimated that he could reach the little desert stream known as the San Felipe, which flowed in the springtime from the Cuyamaca range, out onto the desert, in four days of hard travel. The second day out, one of those terrible simoons of the American desert suddenly sprang up, nearly suffocating the venturesome traveler and his animals. The air was filled with choking dust, alkali, and sand, the road-way was quickly drifted full of sand, and for a time progress was almost impossible. Imitating the practice of the Arabs on the Nubian desert, he lay prostrate upon the ground, covering his head with a handkerchief, to keep out the suffocating dust. For hours the storm continued. At times he made a little headway, but realizing that he could not determine the direction in which he traveled, gave it up for a time. During one of the intervals of forced rest the pack-horse strayed away, and when the loss was discovered, and it was possible to travel again, the drifting sand had left no trail, and the crippled prospector was alone with his saddle animal and only a short ration in his saddle bags, his provisions being mostly on the pack-horse. During the night the wind abated and Pegleg moved forward, shaping his course by the stars, as he had done many times before. He was in search of water now, but daylight came and he had reached no spring. His little supply of water in the canteen was running dangerously low. He was surrounded by strange low hills—ridges unfamiliar to him. He finally decided to make for three small buttes, which raised a little above the surrounding hills, and there endeavor to get his bearings, for in this trackless waste the traveler, like the mariner, must steer by compass or by landmarks. After an hour's weary tramp through the deep yielding sand—the most tiresome walking imaginable—he reached the nearest of the three conical little hills. His weary horse he left at the foot of the slope, while he ascended to the low summit. As the sun was rising in the east, far across a stretch of unbroken sand, arroyo, and dry mud lake, he gained the summit of the eminence, and gazed around. He saw at once that he was off the main trail several miles. To the northwest lay Warner's Pass. He studied the low ridges and neighboring hills. Many were mere dunes of sand, others were of rock, as could be determined by their clear-cut, rugged outline. The hill upon which he stood was of rock, blackened, and burned by the fierce desert sun, but presenting little of variety. It all looked black, all was coated with that peculiar gloss familiar to the desert traveler. Light-colored rocks and dark, look alike here. With the instinct of the prospector Pegleg glanced around, and knocked off a few chips from what appeared to be a dike or vein. A single look showed gold—a mat of gold in a bluish-black quartz; feverishly he attacked the ledge; pieces were spalled off from a score of places, and gold showed everywhere. He could hardly believe his senses, but the evidence was indisputable. Here was the vein and in it the gold—such ore as he had never seen before, nor dreamed of. Pegleg was a practical man. He had seen enough to satisfy him; delay was dangerous; he knew that to return later would be easy. At the time he was wholly unprepared to do anything with his discovery, his only fear being that some other might find it. He realized his physical condition, and the scarcity of the water upon which his life depended. His horse was weak, indeed, dying, for the simoon produces a raging thirst in both man and beast. He must leave this newly-found fortune and hasten on to Los Angeles as rapidly as

possible. He at once descended the hill, taking all the ore he could conveniently carry, and this he placed in the saddle-bags. Mounting, he rode slowly to the northwestward headed for Warner's Pass, still many dreary miles away. On and on, hour after hour, he rode or walked, hoping to again strike the trail. His water was now exhausted, his horse no longer able to carry him, and each moment growing weaker. The sun had become a blazing metallic ball suspended in an atmosphere of crystal. Every object viewed across the desert plain was distorted by the radiant heat of the sand. The half-crazed prospector saw, only a mile beyond, fields, beautifully fresh, and amid them a pelucid stream, delightfully blue, and fringed with trees of living green. What a glad sight to both man and horse. Poor Pegleg! To him it was only added torture, for by similar experience he had learned long since to recognize that lure of the desert—the mirage. He knew that where appeared green fields was nothing but sagebrush and griswood—the river, a phantom. He made haste, however, as rapidly as possible, stumbling, falling, crawling. Sharp poisonous thorns of the cholla cactus penetrated knees and hands; he was indeed a pitiable object; nor was his horse in better condition.

At last, when he was about to give up all hope, he recognized some neighboring ridges with their yuccas, and knew if he could only reach them he might obtain water. How gladly would he have given his mine of gold for only a canteen-full for himself. Late in the afternoon he reached a small spring, a short distance from the traveled emigrant trail. He and his horse drank deeply, and after resting until nightfall they set forth once more toward the Cuyamaca mountains, looming darkly in the west. They seemed very near just before night, but it was still many miles to their base.

Painfully Pegleg slowly advanced, and in time he reached the San Felipe and Warner's Pass, and a few days later, Los Angeles. During his journey through the more settled portion of the country not a word of his discovery did he breathe—he dared not—for the merest hint of what lay out on the summit of that low desert hill, would, he knew, send every man in southern California, who could possibly go, stampeding into the wilderness beyond the Cuyamacas.

When Smith reached Los Angeles he was very ill. He took a room at a small hotel, carried his saddle-bags into his room, tossed them under the bed, sent for a doctor, and went to bed. From this bed he never got up. Exposure, hardship, nervous excitement, and old age, each aided in breaking down the hardy desert pioneer. Realizing that his end was drawing near, Pegleg asked the doctor to pull the saddle-bags from beneath the bed. He did so, and drawing forth the golden pile of rock, he looked in astonishment at the man and the ore. Smith, rapidly sinking, laboriously told of his discovery. The sandstorm; the three hills; the gold; the mirage; the battle with thirst; and the final reaching of his destination. "I can't pay you, Doc," said Smith. "I'm going. Take the mine—she's yours. About 30 miles from Smith mountain, southeast from Warner's Pass, and south of the Butterfield trail." Smith died, and left this legacy to his friend, the physician who had attended him.

This is the story of the Pegleg mine as it has been told and re-told a hundred—perhaps a thousand—times in the mining settlements and about the prospectors' camp-fires of the Southwest. Hundreds of men have searched diligently for the Pegleg mine, but it has not been found, nor do I believe it ever will be, for in my opinion it is a fabrication, pure and simple. Started as a newspaper yarn of half a century ago, it has been repeated with many variations and modifications until many have believed in it implicitly. It is no exaggeration to say that not less than a score of brave but indiscreet men have laid down their lives in the pursuit of this will o'the wisp. I knew personally five men who died on the desert of the Colorado, and one who lost one of his hands and an eye by explosion of nitro powder—all in search of the ill-fated Pegleg mine. Nor has the search been abandoned. Each year still sees men go forth silently into the desert from the cities of southern California to look again for the mine that has no existence.

About the year 1861, a party was slowly wending its weary way across the desert through southwestern Nevada, not far from the California line. Water was short and in the hope of seeing some indication of water, one of the party, a man named Breyfogle, left the caravan and climbed up a neighboring hillside. He did not find water, nor see any sign of any, but he did find a quartz ledge, glittering with dull gold. He looked carefully about, took his bearings, hid a few small pieces of the wonderfully rich ore in his pockets, and returned to the wagon train. He said nothing of his discovery, for he was 'at outs' with the members of his party. Indeed, all were at outs, each with the other, for travel across the desert, hundreds of miles, had made each man a sordid selfish animal, ready and eager to take any personal advantage of his companions, if it would in a small degree relieve himself of hardship, privation, and responsibility.

After weeks of toil, loss and illness, the party reached San Bernardino, and eventually Los Angeles. Breyfogle made public his discovery, and considerable money was subscribed to outfit an expedition to locate the Breyfogle mine. The fortunate discoverer returned as a guide with the party, but when he reached the Death Valley region near which the find had been made, he was unable to again find the ledge from which he had broken the rich specimens. For days the members of the party searched, but in vain. Finally, concluding that they had been deceived, the angry men decided to give Breyfogle short shift, and informed the unfortunate prospector that he would be given a few minutes in which to settle accounts with his Maker. Breyfogle walked slowly up the hillside, leaving his scowling, muttering companions to decide upon the manner of his death. Overcome at the sorry fate which had overtaken him, he sat down upon a ledge of rock. Chancing to glance at the rock he saw numerous colors of gold. "I've found it, boys!" cried Breyfogle. "Here is the ledge." All rushed to the spot, and, sure enough, here was a quartz vein rich in gold. Locations were made, and eventually considerable gold was recovered from the mine, but few—not even Breyfogle himself—believe that it was the same vein that he had discovered before. It is said by some that the Montgomery mine is where Breyfogle made his original discovery. Others say it was at Bullfrog. As to this I am unable to say.

Some years ago I was one of a party that set out to search for a 'lost mine,' which still remains lost. A well known miner and prospector of the city of San Bernadino, California, had in his home a cabinet of minerals. One day a friend, looking over the collection, picked up a piece of heavy black ore, and asked with interest where it came from. After regarding the rock for some time silently, the owner said: "O yes, I remember this ore. We found it out on the desert four or five years ago."

"Do you know where?" inquired the friend.

"Yes," replied the other. "It was on the edge of a dry lake, not many miles from Rabbit Springs. Is it any good?"

"Good!" said the friend, "well, rather! It's almost

solid horn-silver, worth anyway $6,000 to $8,000 per ton."

The matter was carefully talked over, a sketch map made, and a four-horse outfit with four men, tents, tools, provisions, and every essential might soon have been seen going up the Cajon pass, headed for the Mojave desert. They searched for days, but unsuccessfully. Three seasons in succession, they looked, but in vain. They finally gave up the quest, and the map came into the possession of a friend of mine. Having business on the desert at Silver Reef, a few miles from Rabbit Springs, we decided to look for the lost mine, in the vicinity. By aid of the sketch map, and joined by two other men, we searched the hills and found every detail as described by the original discoverers, but instead of horn-silver we found only black tourmaline.

The conclusion reached was that the owner of the cabinet had become confused in his identification of the original sample, which had come from some other region.

Each important desert locality has its own lost mine. On the Colorado desert it is the 'Pegleg' mine. In the Death Valley region it is the 'Breyfogle,' or the 'Gunsight.' On the Mojave river, it is the 'Lee mine.'

Lee was an old, erratic German prospector, who owned claims all over the desert. He was supposed to have located a vein in which the native silver cropped out on the surface in abundance. Although there are plenty of descriptions, and bearings, yet the Lee mine remains undiscovered, probably because, like the Pegleg mine, it never had an existence. Curiously, however, Lee had among his numerous locations one he called his quicksilver mine. This was situated about four miles north of Barstow, and about three miles from the Mojave river. Although the rock was various bright shades of mineral red, due to abundant hematite, there was not a grain of quicksilver in the entire hill. Lee did considerable work on this prospect, but appeared to attach no particular value to it, preferring, when rustling for a stake in San Bernardino, to talk of his 'white metal' mine—the one which no one has ever been able to find.

One day 20 years or more ago, Lee was found dead near Old Woman's springs, with a bullet hole through the back of his head. His 'quicksilver' mine was jumped by men searching for the lost Lee mine. It eventually proved to be a rich silver mine from which several millions of dollars have been taken.

The desert teems with story and romance. Many fortunes have been made there, in gold, silver, copper, lead, borax, salt, and other minerals, and far more doubtless remains to be taken from the mines, but no story yet told of early days and lost mines has eclipsed, or even equaled, the richness of some of the deposits found in the Goldfield region of Nevada. No one of the desert romancers, who play upon the credulity and cupidity of merchants and others in the cities, has yet dared to represent having found anything one-half as good as was discovered during the first year at Goldfield. Nevertheless, the fairy stories of the desert have been an important factor in the development of that region, and we may expect to hear of many more 'Lee' and 'Pegleg' mines, and possibly of other Tonopahs, and Goldfields, and Bullfrogs. The desert will long remain incompletely prospected.

A MIST OF WORDS, like halos round the moon, though they enlarge the seeming size of thoughts, make the light less, doubly. It is the thought writ down we want, not its effect, not likenesses of likenesses; and such descriptions are not more than gloves, instead of hands to shake, enough for us.

REAL knowledge in science means personal acquaintance with the facts, be they few or many.

Experiments With Lava From Vesuvius.

*The author had the opportunity, in April, of seeing the place on Mt. Vesuvius where, only a short time before, the great outpouring of lava occurred, and later he examined the new fields of lava at Bosco tre Case and Torre dell'Annuziata.

Both places showed a number of 'fumaroles,' or smoke-holes. Vapors arose from numerous cracks and crevices, and delicate deposits were being formed at the edges, before the very eyes of the observer. On the volcano itself, these deposits were yellow to orange in color and consisted mainly of alkali and iron chlorides. Below, near Bosco tre Case, the sublimates were chiefly white, consisting of ammonium and sodium chlorides.

On the mountain the steam from the 'fumaroles' frequently contained hydrochloric acid, as readily perceived by the odor, and occasionally even the smell of free chlorine was observed. At another place sulphuretted hydrogen occurred and there was evidence of sulphur dioxide. Below, the vapors consisted mostly of steam. Hydrochloric acid was rarely noticed, while free chlorine was not observed at all.

The present theory of the formation of these 'fumaroles' is as follows:

When the volcanic magma leaves the crater, it is highly charged with steam and gases. These escape during the cooling process, as the conditions of pressure, etc., change. The basis of this theory is apparent, for the upper parts of cooled lava are porous and spongy from the bubbles of escaping gases. Among these, aqueous vapor predominates, but hydrochloric acid is nearly always present, and probably vapors of sodium chloride and other volatile substances. Direct proofs of the last assertion are still lacking, however.

These vapors at first escape rapidly, often causing explosions; then more slowly and finally they cease altogether. Fumarole activity begins when the explosions have stopped and the gases escape quietly and regularly. The products of the fumaroles are the same as come from the crater itself. The present theory maintains that all the substances produced by the 'smoke-holes' are present in solution, *already formed* in the volcanic magma.

It was observed by the author while examining the lava near Bosco tre Case, that some places showed considerable fumarole activity, but others, where the conditions of heat, thickness of the lava-bed, etc., were apparently the same, showed none. For instance, no 'smoke-holes' were to be observed where the lava had filled a railroad cut, while close-by, in a ravine, they occurred in great numbers. In the cut the lava lay on a prepared and therefore comparatively dry bed; in the ravine it covered vegetation (to judge from the vicinity) and damp ground, for a lake was not far distant. Doubtless the lava vaporizes the moisture gradually, which then forces its way upward through crevices in the hot mass. To determine whether steam decomposes lava, causing the fumaroles, was made the subject of experiment.

Natural conditions were readily imitated on a small scale, with the following results: Pieces of lava were washed until they gave no chlorine reaction with silver nitrate, dried and placed in a combustion tube. The tube was then heated, strongly in the middle, less at each end, and a current of dry air passed over the lava. A little water showed first, and after about three hours a faint, bluish-white sublimate appeared. The water gave only slight traces of chlorides and was carefully removed along with the sublimate. A current of moist air was then passed through, and in less than half an hour

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* Translated from the *Zeitschrift für Angewandte Chemie.*

sodium chloride, solid and in solution, appeared in such quantities as to give a strong reaction.

A second experiment with washed lava gave water and a white sublimate after heating two hours. On removing the deposits and continuing the heating another hour a second faint white sublimate was obtained, but no iron showed. On passing moist air containing hydrochloric acid, crystals of ferric chloride began to form after a few minutes in the cooler portions of the tube, and at the same time there was a strong smell of chlorine.

The formation of chlorides is readily explained, since it is seen that water and hydrochloric acid decompose lava, but the production of chlorine is not so easy to understand. It might be due to oxidation of hydrochloric acid by the lava, to decomposition of ferric chloride or to oxidation by air. To determine which occurred, lava was heated in a current of dry hydrochloric acid gas. Ferric chloride sublimed, traces of water appeared, and a very faint odor of free chlorine was perceived. On substituting moist hydrochloric acid, the results were unchanged, but as soon as air was admitted the chlorine increased considerably.

Cutting out the air again, the chlorine almost ceased.

This experiment could be successfully repeated as often as desired. When pure ferric chloride was treated with dry or moist hydrochloric acid, under otherwise identical conditions, the smell of chlorine was barely perceptible and less than in any of the former experiments. The formation of chlorine is, therefore, only in very slight degree due to the dissociation of ferric chloride. More is produced by the action of lava on hydrochloric acid, but the chief source is the oxidizing action of the air. It is also possible that catalytic processes are at work.

The circumstance of water-vapors, alone or mixed with hydrochloric acid and air, passing through hot lava occurs frequently in nature. Both water and hydrochloric acid can originate in the volcanic magma, or the water may have its source in moist ground upon which the lava rests. The products of sublimation are therefore not necessarily all present in the lava as such, but must be produced, in part at least, by the action of aqueous and hydrochloric acid vapors on the magma. When steam alone is present, white sublimates occur, while hydrochloric acid gives colored ones containing iron. If both are accompanied by air, there is formation of free chlorine.

Thus certain observations, formerly looked upon as insoluble riddles, are easily explained. For example, J. Roth said in 1857:

"On closer study of lava much is observed that is difficult of comprehension. Among other things there is the slow, but considerable evolution of volatile matters.

Some of these substances are vaporized at comparatively low temperatures, such as water, hydrochloric acid, ferric chloride, etc.. while others, like sodium and potassium chlorides, require much more heat. All these should be found in greater quantity in fresh lava than in the older whose surface is already 'frozen.' Their evolution from fresh lava also seems not to last very long. The lava's viscosity might account for the retarding and long continuing sublimation, but the elasticity of the substances — gaseous at 212° F. or little above — must be very great at the high temperature of the lava. On breaking up lava three miles distant from Vesuvius from the eruption of 1767 for road metal, its interstices were found encrusted with crystals of hematite.

Therefore ferric chloride was not only contained in the lava at this distance, but it was *formed* when the lava had cooled so far that it had begun to crack. * * * The lava from the last eruption shows that evolution of volatile matters increases after solidification has begun. The increased development of steam cannot be ascribed to rain falling on the lava, for it did not coincide with the rainy weather and the new fumaroles, formed after the lava had ceased, either emitted no water-vapor at all, or else it was mixed with other substances. The products were mostly sodium and potassium chlorides, which require a very high temperature for their vaporization. This was most evident in Fosso della Vetrana and at the ruined bridge between San Sebastiano and Massa di Somma, where the exhalations immediately after 'freezing' of the lava were considerably less than they were a month later. In Fosso della Vetrana evolution of gas only began toward the end of June and beautiful salt-crusts were still depositing early in November. The opening was covered with a large piece of lava on September 25, and was encrusted in less than two days with salts five-sixteenths of an inch thick."

If it is assumed that lava flowed over moist ground or such as became moist through later rains, and there was hydrochloric acid present, the observations formerly so hard to understand, are at once explained as the effect of secondary chemical action of water and hydrochloric acid on lava.

The theory of the formation of fumaroles is to be extended as follows: In this natural process mechanical expulsion of already formed alkali and iron chlorides does not necessarily occur in every case, but these chlorides are produced secondarily under certain chemical conditions by the action of water and hydrochloric acid gas on hot lava. In which cases mechanical or chemical processes occur separately and alone or together, can only be decided by further observation and experiment.

NUMEROUS IRON OBJECTS of prehistoric date have been found in northern Europe, where iron was undoubtedly the first metal to be used. Iron weapons, too, have been found in the remains of pile dwellings in Switzerland. In that country the Bernese Jura abounds in remains of prehistoric iron smelting, which have been carefully investigated by Quiquerez, a scientifically trained mining official. The furnaces were in dense forests, in order to obtain an easy supply of wood. The workmen dwelt in caves, and charcoal was burned in piles. The furnaces were all similar, differing merely in size. On the natural ground, with no foundation, the hearth of firebrick was laid. Lumps of the same material formed the walls, which were supported externally by dressed stones filled in with earth. Two inches above the hearth a channel was left open, which had the entire width of the hearth, was arched over, and widened out at the exterior. It was made of fire-clay, the aperture consisting of several large stones which were covered with a stone slab. The shaft of the furnace was cylindrical, and inclined toward the top, so that charcoal and ore would pass down on one side, leaving the other free for the air-current. The shaft was eight feet high, and the top was surrounded by a circle of stones. The furnaces were charged from above. The air entered at the base, no bellows being used. The opening at the base thus served as a tuyere, slag-hole, and discharging hole for the blooms, which were from 30 to 50 lb. in weight. At several of these prehistoric furnaces flint implements were found, showing that the Swiss iron industry dates back to the storage, before bronze was introduced by foreign merchants.

IF it were possible to have all the phenomena of the past presented to us, the convenient epochs and formations of the geologist, though having a certain distinctness, would fade into one another with limits as undefinable as those of the indistinct and yet separate colors of the solar spectrum.

Prospecting With Churn Drills.

Written for the MINING AND SCIENTIFIC PRESS
By F. S. PHEBY.

Believing that the great horizontal orebodies of the Ely district could be more cheaply and expeditiously tested by the use of the drill rather than through the usual tedious and expensive method of shaft-sinking, the Ely Central Copper Co. purchased two drills, manufactured by the Keystone Drill Co., of Beaver Falls, Pennsylvania. These drills were hauled from Cherry Creek to the mines, a distance of 60 miles.

These machines are type No. 3 and weight 12,000 lb. each. A complete outfit of tools and equipment for recovering any parts of the drills lost in boring the holes, were included in the order.

The first drill was installed on the property in August and we had a hole completed to a depth of 308 ft. within 23 days, although but one shift was engaged in this work. It is far more economical in wood and water to keep the drills running continuously with three shifts. More than three times the sinking can be done in the same number of days, as steaming up in the morning generally comes out of the one shift. The drill averaged 13.3 ft. per shift for the 23 shifts, but if shut-downs are deducted, the drill averaged 19.6 ft. per shift of actual operation.

We have found in all our work that casing is necessary in every hole. At times we have sunk 200 ft. without casing, but to go deeper casing was necessary, which meant that the hole had to be rimmed out at an expense of more than the original cost of the hole for the 200 ft. I caution anyone contemplating the purchase of a drill, to provide 7⅝ casing for one-third the depth contemplated, 5⅝ casing for two-thirds the depth, and 4¼ casing for full depth. This we had not done, and probably 25% has been added to the cost of each hole, working without sufficient casing. Trouble may not be encountered in several hundred feet, but a soft stratum of ten feet will require the casing for the entire hole.

We soon learned that the wear and tear on the drilling cable was severe. Under ordinary circumstances, each rope is safe for 1,500 ft. of drilling. When we appreciated that our ropes were deteriorating, an order was placed at once. By October 1 the cable had not arrived, and we were compelled to order by express from Ohio a coil of rope weighing 1,850 lb. With each drill, two ropes of the same length as the depth of the hole contemplated should be ordered.

Water is required for both the boiler and for diluting the drillings so that the sand-pump may bale them. The greater quantity is required for the boiler. This item of expense is local with each hole. It is advisable to haul water in a good wagon-tank, as the drills may be moved many times, and the cost of pipe might be greater than the cost of hauling. A drill-man and helper are required on each shift; the former receiving $4 for eight hours' work and the latter $3.25. The item of fuel and water is wholly relative, but will be given in our particular case, and may be taken as an average for this district.

The following is the tabulated costs for a certain hole which we have taken as an average :

Shifts of sinking (eight hours each)	23 days
Depth of hole	308 ft.
One drill-man, wages	$ 82.69
One helper and assistance while handling casing	81.08
¾ cord of wood each shift, at $4.50 per cord	77.51
12 bbl. water at $6.50 for hauling, 8 days	52.00
12 bbl. per day (when running two rigs), 15 days	48.75
Coal and oil	7.60
Miscellaneous charges	12.20
Superintendence	50.00
Cost of 308-ft. hole	$411.83
Cost per foot	$ 1.33

Some water was encountered in this hole, and I may say roughly that a two-compartment shaft for the same depth with equipment, would have cost about $12,000, or $40 per foot.

The question has often been raised concerning the character and accuracy of the sample obtained from this work. With small rich veins there may be an objection to the use of drills, but in orebodies like those found at Ely, I believe as good a sample can only be taken with great care. Most of the sludge or drillings will pass a 20-mesh screen, and a good method is to provide a large box with a capacity equal to several screw-lengths. I might say that a screw is three feet long, and when fed out, the clamps are changed on the rope, and the hole baled, or sand pumped. By settling and decanting the water, the entire product of the hole may be saved and sampled. In ordinary practice it is sufficient to dip a sample from the box and pour the same into a box partitioned off in compartments about the size of common brick. This sample, when dried in the sun, is compact enough to be sampled by chipping, and can be shipped and carried about without breaking.

In a hole carried down without casing, there is danger of knocking down particles from the upper portions of the hole. This will vitiate the sample, but the harm done is more theoretical than actual. As is well known, the orebodies of Ely are the impregnation of a great stockwork of porphyry, and an orebody of much value must be a hundred or more feet thick. While actually in ore, the sampling must be done with extreme care, but often the hole, all or in part, may be in barren country rock, and only a knowledge of the formation penetrated is desired.

The best test, where not in ore, is obtained by panning the sample. This concentrates the coarse particles, which are clear to the eye if a magnifying glass of low power is used. In oxidized formations some doubt often arises as to whether the drillings are composed of porphyry or limestone. A small bottle of dilute hydrochloric acid will soon settle this question with entire satisfaction. We have made a practice of saving a sample of each formation penetrated, in four-ounce bottles. This gives a clear picture of the hole, and is valuable for future reference.

Our drills are provided with traction gears, and may be moved at will over the roughest ground. This saves the expense and trouble of procuring teams. The winter weather is severe for outside work, and sectional houses, so made as to be readily knocked down and moved, have been constructed to enclose the drills, and within these houses the men work in comfort.

The cost of a No. 3 drill is as follows :

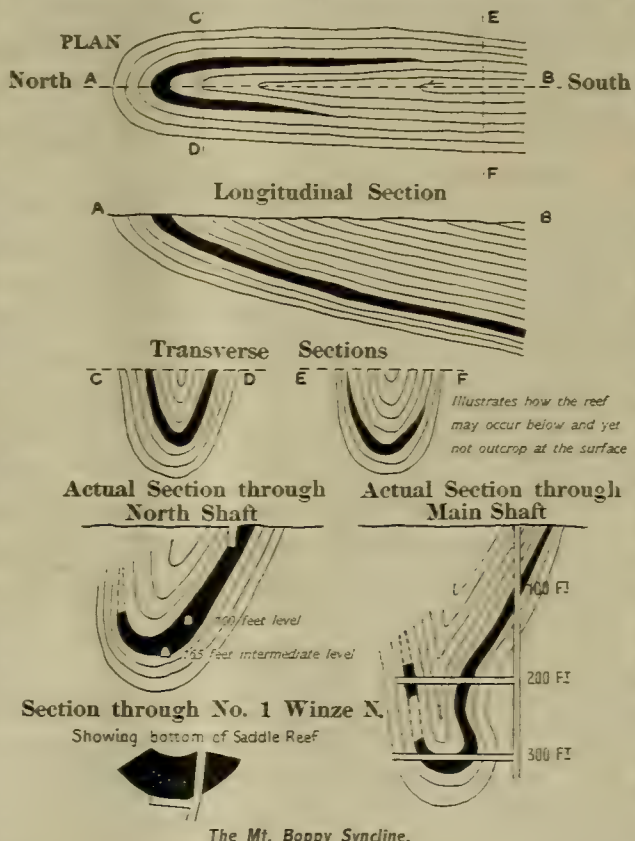
Drill f. o. b. Beaver Falls	$1,400
Cost of casing for 400 ft. and fishing tools	350
Freight to Cherry Creek, Nevada	328
Hauling 60 miles from Cherry Creek	225
Cost of No. 3 drill, good for 500 ft., laid down on the ground	$2,303

A drill of this size is light for holes of greater depth than 500 ft. The size recommended is a No. 5, good for 1,200 ft., and the cost of the same with traction gear, is about $2,500 laid down at Ely. Should five holes of 500 ft. each be sunk, the cost of equipment per hole will be $500, about the price of a good whim outfit. The cost of $1.50 per foot is so much cheaper than any shaft work as not to be comparable. Water does not retard the work of drilling; in fact, it is a benefit.

I can heartily recommend the use of three drills for prospecting in this region. Apart from the cost per foot, the time in which a good working knowledge of the ground can be obtained, is a great factor. The sample is quite as good as a core, and most ground can be penetrated at 25% of the cost incurred with a diamond drill; while the expense of equipment will not exceed 30% that of the diamond-drilling outfit.

A Profitable Syncline.

Miners are familiar with the occurrence of gold ore in the form of saddles or anticlinal formations of quartz, both at Bendigo, Australia, and in Nova Scotia. It has been reserved for New South Wales to furnish an example of an inverted saddle or syncline of rich goldbearing quartz. Such is the deposit at Mount Boppy, situated about three miles off the Nygan-Cobar railway. The district had been mined for copper for a great many years, but it was only six years ago that gold was found. For the last three years Mount Boppy has become prominent, by reason of the profitable operations of an English company, and a town of 1,500 people has sprung up. The mine is the largest gold-producer in the State, the ore averaging 12 dwt. per ton. In the Annual Report of the Department of Mines it is stated that "payable ore has been found on the upper levels of the mine for a distance of 1,300 ft. The orebodies vary in width from 6 to 50 ft. If the longitudinal section be referred to, the stopes in the northern end of the mine will be seen to terminate in their downward extension against the so-called 'slide.' The term 'slide' is a misnomer and misleading. We have here not a line of faulting, but a natural plane of parting between the ore and the country along the bottom of the saddle or synclinal fold. The so-called new make of ore upon the west is nothing more than the western leg of an inverted saddle, of which the main lode is the eastern leg. The structure of the ore deposit will be more clearly understood after reference to the accompanying ideal plan, and longitudinal and transverse sections, and also the actual sections taken across the reef. The curved base of the saddle reef can be well seen at the 200, 300, and 400-ft. levels respectively. It is met with in the 130-ft. level at a point 360 ft. north of the main shaft, and in the 400-ft. level at a point 400 ft. south of the main shaft. So it would appear that it pitches southward at a high angle. A glance at the longitudinal section will show that the angle varies between the different levels of the mine. It will probably be found that the whole orebody pitches south with the syncline, and a correct appreciation of this fact should have a most important bearing upon the efforts which are being made to pick up the lode beyond the existing workings.



The Mt. Boppy Syncline.

The legs of saddle reefs do not extend downward, or in the case of an inverted saddle upward, for an indefinite distance, and it is quite likely that owing to the southern pitch of the syncline, the legs of the reef may at this point be considerably more than 100 ft. below the surface, and the main body of the ore, which rides in the trough of the syncline, at a depth of several hundred feet. Indeed, the disappearance of the reef in the southern end of the upper levels may be due to the pinching out of the legs, and it will probably be found that as greater depths are reached and the bottom of the syncline approached, the lode will extend farther and farther to the south. It would appear, if the lode be continuous and the pitch of the main body of the ore does not materially alter, that it must pass right under the cross-cuts.

In this connection I should point out that the length of the legs of a saddle, or the distance they extend from the cap of the syncline or anticline, as the case may be, is liable to differ for each leg and to vary considerably along the same lode. For instance, in the case of the Great Broken Hill silver-lead lode, using the cap of the saddle as a datum or starting point, the western leg seldom if ever extends more than 100 or 200 ft. downward, while the eastern leg (which has in at least one place been found to give out altogether at 300 ft.) has been proved in other places to extend over 700 ft. At Mount Boppy there is evidence to indicate that the western leg is not so persistent as the eastern. Again, a lode which may have the normal outline of a saddle throughout the greater portion of its length may in some cases, owing either to the action of conflicting forces at the time of, or subsequent to its formation, be distorted almost beyond recognition. This is noticeable in some places at Broken Hill, and the section through the main shaft shows how the Mount Boppy reef has been distorted at this point.

The oxidized ore is composed essentially of quartz, with a small admixture of oxide of iron, and the unoxidized ore of quartz with iron and arsenical pyrite, galena, and zinc-blende. Gold is always present in an extremely fine state of division. The ore hitherto treated only contained insignificant quantities of copper, and this remark applies also to the unoxidized ore now being raised from the lower levels as well as to the oxidized ore. It is on this account that the ore from Mount Boppy has proved far more amenable to treatment than that from certain other mines in the Cobar district."

THERE is no study better fitted than that of geology to impress upon men of general culture that conviction of the unbroken sequence of the order of natural phenomena, throughout the duration of the universe, which is the great, and perhaps the most important, effect of the increase of natural knowledge.

IT should never be forgotten that what we call 'catastrophes' are, in relation to the earth, changes, the equivalents of which would be well represented by the development of a few pimples, or the scratch of a pin, on a man's head.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

A lease of mining property stipulated that the lessee should comply with the laws of the State, and surrender the premises at the end of the term in good condition as an entire mining property. At the time of the surrender of the lease, there was water in a portion of the mine, and there was no escapeway except a shaft sunk by the lessee on adjacent property. The lessee, at the end of the term, surrendered the premises as an entire mining property exclusive of the escapement shaft as constructed by him on the land of another. In passing upon the rights of the parties at the time of the surrender, the Court decided that the lessor, though bound to pay for permanent improvements constructed by the lessee, was not required to pay for the escapement shaft; that not being entitled to an escapement shaft and an escapeway to constitute the premises an entire mining property, a decree requiring the lessee to pay the cost of removing the water and the cost of removing obstructions in the escapeway was erroneous, as the statute only required an escapement shaft, or an escapeway, but not both.

Junction Min. Co. *v.* Springfield &c. Co., 78 N. E. 902.

A lease of a coal-mining property for a fixed term gave the lessee the exclusive right to mine on the property, bound him to take the premises as an entire mining property, to mine and sell the underlying coal as speedily and in as large quantities as possible, to pay the lessor a royalty on the coal mined, to quit the premises at the end of the term in good condition as an entire mining property, and bound the lessor to purchase the property of the lessee then on the premises, and pay for all the improvements of a permanent character made on such premises by the lessee. In a controversy of the rights of the parties at the end of the term, the Court decided that the lease contemplated that in the operation of the mine by the lessee, some of the personal property on the premises at the beginning of the term would be worn out by use, and that the lessee would substitute therefor new property and fixtures and would from time to time provide additional property and fixtures necessary for the operation of the mine, and make permanent improvements; and for all of which the lessor must compensate the lessee at the end of the term. But the lease did not require the lessee to rebuild worthless buildings that were destroyed by fire without any fault of the lessee, they not being necessary to constitute the premises "an entire mining property." The lease also prohibited the lessee from mining and taking coal from other than the demised premises. But the lessee did mine coal from other lands with the knowledge of the lessor and without any protest from him and the lessor received and accepted the royalty on the coal thus mined from other premises with full knowledge of this fact. The Court decided that the lessor was not entitled to damages for the violation of the covenants of the lease against mining on adjacent property.

Junction Min. Co. *v.* Springfield &c. Co., 78 N. E. 902.

The statute of Pennsylvania makes it a misdemeanor for anyone to engage as a miner in any anthracite coal mine, except he first obtain a certificate of qualification and has been duly registered to engage as a miner in any anthracite coal mine. As a qualification for such certificate the applicant shall have had two years' experience as a miner or mine laborer in the mines of that Commonwealth. In placing a construction upon the statute, the Supreme Court of Pennsylvania decided that the act should be construed so as to require two years' experience in the anthracite coal mines of the Commonwealth, and as thus construed it was not unconstitutional as controverting the Constitution of the United States in respect to the privileges and immunities of citizens.

Commonwealth *v.* Shaleen, 64 Atl. 797.

The Prospector.

Enquiries sent to this department are answered free of charge, if submitted by subscribers who are not in arrears. The full name and post-office address of the sender must be given, otherwise no answer will be made. Those who are not subscribers must accompany their questions with a fee of $3 for each question. No assays are made.

The rock sent by P. H. McM., of Randsburg, Cal., is a biotite gneiss.

The small pieces of slate sent by S. T. P, of Palisade, Nev., are not oil-bearing.

Specimens from Paris, Cal., marked E. F. E., are: No. 1, Schist, containing pyrite; No. 2, Rhyolite; No. 3, Melaphyr; No. 4, Rhyolite-tuff; No. 5, Limestone.

Samples from Homestead, Ore., marked M. R., are: No. 1, Limonite and quartz; No. 2, Silicious rock with hematite and serpentine; No. 3, Pyrite in quartz; No. 4, Talc schist; No. 5, 6, and 7, silicious rock, mainly quartz stained green with chlorite or serpentine.

A Strange Clean-up.

Not long ago, the Bonanza Basin Gold Dredging Co., operating an Allis-Chalmers gold dredge in Alaska, reported the finding of a perfect specimen of magnetic iron ore, or lode-stone, in the clean-up. Although, from its unusual size, the specimen referred to was remarkable, it seems that a still more curious find was made recently by the same dredge. When the long sluice-box was opened recently, preparatory to the periodical clean-up, it was found that the bed of the slough which had just been worked, had yielded an assortment of stuff, the equal of which has never before been seen in Dawson or elsewhere in the mining regions of the West. The collection disclosed, among other things, two Russian bronze ikons, which had probably been carried into the region by Russian explorers many years before the Klondike was heard of. The ikons were identical with those carried by some of the regiments of the Czar's army in the recent Japanese war. Besides the ikons were found eight American pennies, probably thrown into the slough by some prospector in a fit of disgust when he realized that they possessed no purchasing power in the Yukon district. There were also recovered about 100 lb. of unexploded cartridges, gallons of bullets, many of which had a coating of amalgam, which necessitated their treatment for the gold adhering; 120 lb. of nails of all sizes; an alarm-clock; a saw set; two masonic gold charms; an opal with its setting from a broken scarf-pin; innumerable pieces of watch chains; knives, forks, keys, locks, native bismuth, cassiterite, stannite, bushels of black sand, and a number of nuggets worth over $10 apiece. The last item caused some surprise, as it had been generally understood that the gold in the basin was of a fine quality. The dredge, which is now in winter quarters, has been in operation all summer.

RAILROAD BUILDING in Mexico proceeds vigorously. The Southern Pacific is building a line from Guaymas to Mazatlan and thence to Guadalajara, where connection will be made with the Mexican Central. This road, however, will not prove of such immediate benefit as expected to the mining districts of Durango, because it will hug the coast, and not until spurs are built to the separate districts will they get the facilities needed. The International railroad, that stretches from Eagle Pass through Torreon to Durango, is also to be extended to the Pacific coast at Mazatlan and this will help mining in Durango. Furthermore, a new railway is planned between Tucson, Arizona, and Port Lobos, on the Gulf of California.

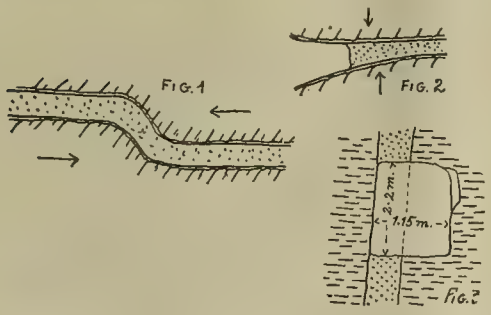
The Cause of Air-Blasts in the Mines at Pribram, Bohemia.

By Hugo Stefan.

*Stresses in the country rock may develop from chemical as well as from mechanical causes, although in the case under discussion the latter alone are of importance.

Assuming that there be at any point in the earth's crust a strain such as would tend to buckle the rocks in which it occurs, it will vary in its effects according to the physical characteristics of the different strata; thus, mild and plastic clays will behave very differently under tension from harder and more brittle coal. Conditions prevailing near the surface, moreover, are different from those at great depths. If the buckling force is brought to bear on a rock stratum at great depth, the direction of the movement taking place in the folding of such a layer will be opposite to that in which the force of gravity acts on the rock. Near the surface of the earth equilibrium of these stresses has long since been established, partly because the original superincumbent strata have been removed by denudation or else because deep weathering or disintegration has loosened the ground and so allowed it to yield readily. As long as any bed in a formation maintains its solid relationship to others, it is in a position to withstand much greater forces than after having been disturbed or loosened.

When the equilibrium of layers of rock is disturbed by



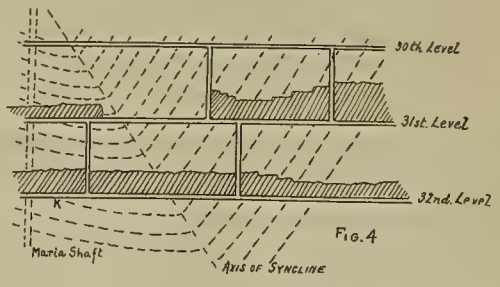
underground workings and sudden changes of strain are produced, breaks may occur with irresistible force, frequently resulting in the phenomena termed 'air-blasts.' In support of this statement the following paragraph may be cited from F. R. von Hauer:

"Interesting observations on what may be termed a latent pressure to which beds of rock in their natural position in the earth's crust are sometimes subjected, and concerning the sudden breaking apart of such beds, have been published by Professor Niles of Boston. He noticed in a number of quarries in the United States that on loosening large sheets of rock from their original position, they underwent considerable expansion. Actual measurements showed an increase in length of at least one in a thousand. It appears that this expansion occurred in a north and south, not in an east and west direction. In a limestone quarry at Lamont, twenty miles south of Chicago, on stripping off the surface, an underlying stratum of rock was exposed, which afterward buckled slightly, forming a wave-shaped crest or anticlinal, the ridge of which extended east and west for over 800 ft. The height of the anticlinal was 6 to 8 in. and its width about 18 ft. Later on a longitudinal fissure formed with a loud explosion along the crest of this fold. The buckling was evidently the result of a horizontal pressure, in a north and south direction, to which the strata yielded as soon as their overburden had been removed."

*Translated for the *School of Mines Quarterly* by C. R. Corning from *Oesterreichische Zeitschrift.*

Aside from chemical processes, therefore, the cause of air-blasts may be assumed to be mainly a combination of several factors: (1) The composition, structure, and cohesion of the rocky strata. These present varying resistance to pressure, together with conditions permitting the equalizing of internal strains. (2) Depth below the surface. Here the weight of the overburden of rock tends to prevent the stress from being relieved by buckling. (3) The advance of surface weathering, if very extensive, produces elasticity in the overburden, which is then easily forced aside or upward by any tendency on the part of underlying formations to form anticlines.

At Pribram a number of silver and lead veins are worked. They are frequently associated with greenstone and diabase dikes. These veins dip from 70 to 90° east or west, and run approximately north and south in a syncline of Cambrian sandstone from 2 to 3¼ kilometres wide. The northwesterly slope of this syncline dips 80°, while the southwesterly side is flat. The Maria shaft is 350 m. west of the bottom of the syncline. At a depth of 1,009 m. (the thirtieth level) the shaft is within 40 m. of this syncline and cuts it at the thirty-second level at a depth of 1,009 m. where a vertical fault-fissure traverses the horizontal strata so that east of this fissure the beds are 25 cm. below their position on the western side. The course of the fault-fissure is nearly at right angles to the sandstone strata. In the easterly and lower strata there are a number of calcite stringers up to one centimetre thick, traversing the strata and starting from, but younger



than, the fault-fissure itself. The individual beds, which often pinch out, vary greatly in thickness as well as in structure and composition. Hard silicious graywackes alternate with clays, both fine and coarse-grained, in dense schistose layers.

The diabases, which are an important element in the structure of the formation, have, when fresh, much of the hardness of feldspar; when, much altered, they are soft. It is evident that the squeezing of the rocks incidental to the intrusion of the greenstones in the graywackes was the cause of much stressing.

The metalliferous veins which occur in the diabase and sometimes also in the sandstone, are accompanied by fissures of calcite, and these again by barren fissures showing many slickensides. All of this indicates that movement has taken place.

Such relations between stratification, country rock, and metalliferous fissures give the entire complex an unusually varied character, so that the various forces to which it has been subjected have produced unequal stresses in its heterogeneous members. This condition of unequal stressing is to be considered one of the causes of air-blasts.

At the Maria shaft there are two distinct conditions producing air-blasts:

1. On driving drifts and cross-cuts in the hard greenstone, a crackling sound is frequently noticed. This is attributable to the formation of small fissures and is a warning to the miner, because angular fragments of rock are often thrown off with loud explosions from the face

of the drift. Fortunately, these pieces are rarely large, but they are sometimes of sufficient size to cause painful wounds. The cause is probably to be sought in the pressure which the hanging and foot-walls exert in many places on the dike or vein formation. In most cases this pressure is produced at points where the vein changes its strike or dip (Fig. 1). A movement of the hanging or of the foot-wall, or of both simultaneously, may then readily bring about a compression of the vein-matter. Such movements, as well as irregularity of the fissuring, are common characteristics of the Pribram veins. In cases where the walls are under pressure and converge, so that the vein-filling takes the shape of a wedge, large and heavy blocks of ground may readily break loose (Fig. 2).

On abandoning work in ground subject to air-blasts, the phenomenon as a rule rapidly quiets down, but promptly begins again when work is resumed. In spite of the use of the best methods of stope-filling known, the conditions in this mine are gradually growing worse, as the stopes extend and as the pressure of the hanging wall is concentrated on continually dwindling pillars of rock, but even under these conditions, air-blasts occur only in hard vein matter or country rock. When the ground is soft or gougy, considerable falls of rock are apt to take place, but these must not be confounded with the sudden and unexpected air-blasts.

2. A much more dangerous situation is produced by another type of air-blast, which occurred for the first time at Pribram in 1897, when the thirty-second level south (1,109 m.) on the main fissure of the Adalbert vein was driven. This mishap cost the life of one of the men. On July 7 of that year the face of the drift was 37 m. south of the Maria shaft east cross-cut, at *K* (Fig. 4). The drift was 2.2 m. high by 1.5 m. wide, and on the hanging wall side was in a greenstone dike, which had gradually pinched as the drift advanced. On the foot-wall the face was in hard quartzitic sandstone, plainly stratified and with a flat dip (Fig. 3). Just after the two miners on shift had thrown back the broken rock and were preparing to drill, a piece of rock, weighing nearly 200 lb., broke loose from the foot-wall side of the drift near the roof, exploding at the same time into a number of angular pieces of various sizes with a detonation like that of a powder explosion. Some of the pieces struck one of the men, crushing his skull and causing other serious wounds. Since then work in this portion of the mine, both on the thirty-first level (1,059 m.) and on the thirty-second level (1,109 m.) has been uninterruptedly continued, the stope at present reaching 15 to 30 m. above the level. Layers of explosive sandstone have been encountered frequently on both walls of the drifts, but fortunately there have been no further casualties, on account of the precautions mentioned below. Sandstone often occurs in the levels and stopes, but as yet no explosive strata have been found above the depth of 1,000 metres and then always in the neighborhood of the intersection between the trough of the syncline and Adalbert fissure, and in the flat south-easterly slope of the syncline. Such air-blasts as the above have never yet been encountered in the numerous workings of the southerly, steeper slope of the syncline.

The pieces of rock which are thrown off with the explosion, bursting into numerous smooth-faced angular pieces, average as a rule half a cubic metre in size. Frequently, a heavy air-blast at a particular place is followed at irregular intervals by a series of minor outbreaks, so that the stope cannot be approached with safety for hours, sometimes even for days. The various beds of graywackes are not all equally dangerous. It is rather the hard, fine-grained silicious layers which act in this way, rather than the mild and clayey strata, and it would appear that sudden changes in the character and structure of the strata are responsible for the occurrence of air-blasts.

All of these air-blasts occurred in the main Adalbert fissure, which as yet is the only vein opened up on the thirty-first and thirty-second levels.

Considering all of the circumstances, the conclusion appears justified that the cause of these explosions is not only the pressure of the superincumbent rock-mass, which is at right angles to the strata, but is due also to a stress parallel to the bedding planes and to the axis of the syncline. This view is supported by the fact that thin streaks or layers of calcite, filling clefts between the strata opened by end pressure, not infrequently accompany the bedding planes of the formation. Such streaks occur at a depth of 1,080 metres on the tenth slope of the Adalbert vein and on the thirty-second level, 110 m. north of the Maria shaft. This explanation is furthermore borne out by a marked slatiness of the country rock, cutting the stratification at an angle of 60 to 90°. Cases occur where the fissility of the rock is parallel to the main Adalbert vein, the bedding planes of the rock at the same time being nearly horizontal. When such ground is under high pressure, it tends to break up into an aggregation of flat slabs. These are the conditions which appear to favor the occurrence of the air-blasts, so that when they occur one or more of the above-mentioned flat slabs are likely to break loose and explode.

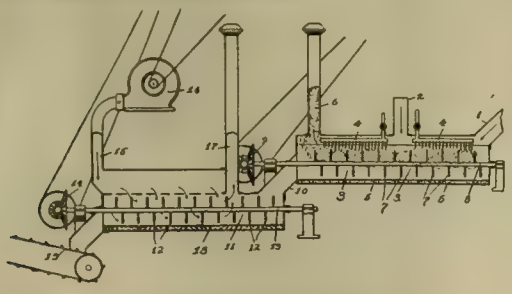
Such conditions of stress demand serious consideration in executing work with a view to the greatest possible safety of the miners. They necessitate immediate removal of any broken ground in the stopes, especially where the walls are suspected of being favorable to air-blasts. Such removal of rock and ore must be promptly followed up by the stope-filling, so that no open spaces are left except those absolutely necessary for handling the ore, for ladder-ways and for ventilation. It is, moreover, the custom to reduce as much as possible the number of stopes in simultaneous operation and to distribute them over as large an area as possible. This is disadvantageous, as such an arrangement prevents concentration of the workings. Work at such points is prosecuted during one shift only, so that the ground is not disturbed for at least 16 hours out of each 24. This is for the purpose of allowing the stresses in the rock to equalize themselves. Only experienced and intelligent workmen are employed, and these are not changed without urgent reason, as it takes some time for men to become familiar with the ground. When air-blasts are anticipated, shields are frequently used. These are made of planks firmly spiked together and are braced against the point of danger by means of stulls. Such precautions, together with others which have been employed from time to time, have enabled the management to meet the danger successfully.

AMALGAMATION OF SILVER SULPHIDE.—It appears that silver sulphide is decomposed in the course of stamp-mill amalgamation. Mr. Keijiro Nakamuri, chief metallurgist of the Besshi copper mine, in Japan, states that at the Sado gold mine, situated on one of the islands in the Sea of Japan, the precious metals occur as a natural alloy having the composition of 58 parts of gold to 42 parts of silver. Even the beach gold, derived from the erosion of the quartz veins, has the same composition, as tested by 500 samples. In the stamp-mill the bullion from the battery amalgam contains 1 part gold to 3 parts silver, and the ratio of silver increases until, after passing over an apron, a shaking copper table, and two Duncan pans, the amalgam contains twelve times as much silver as gold. He considers this due to the decomposition of the argentite in the ore in the course of its passage over the plates and in the pans. He confirmed this by experiments on artificially prepared silver sulphide.

MINING AND METALLURGICAL PATENTS.

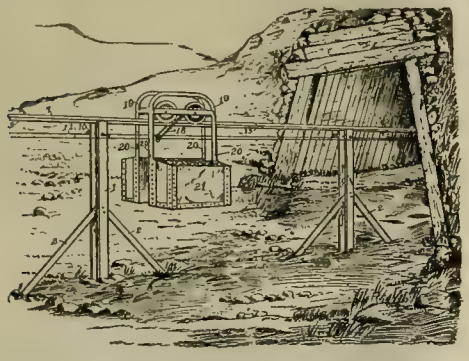
Specially Reported for the MINING AND SCIENTIFIC PRESS.

PROCESS OF BRIQUETING.—No. 836,897; Robert Schorr, San Francisco, California.



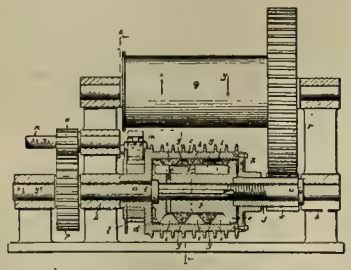
The process of making coal briquets consisting in, first, heating the pulverized coal; second, melting the organic binder separately therefrom; third, mixing both substances while hot; fourth, reducing the mixture to a granular, floury condition by continued mixing under an air-blast; and, fifth, supplying the same while floury and cool to the press to make briquets, substantially as described.

AERIAL TRAMWAY.—No. 836,995; George G. Schroeder, Washington, D. C., assignor to Industrial Motor Company, a Corporation of the District of Columbia.



A monotrack-tramway comprising uprights having their upper ends split and expanded to form sockets, and a rail of substantially arrow form in cross-section having its body fitting in the split portions of said uprights.

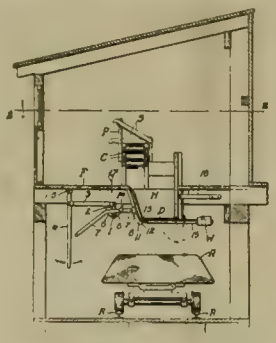
AUTOMATIC LOAD-BRAKE.—No. 836,912; Matthias A. Beck, Milwaukee, Wisconsin.



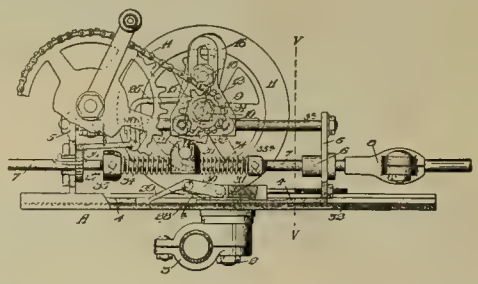
In an automatic load-brake the combination of a shaft having two expanding heads mounted thereon, one of said heads being movable axially toward and from the other, an expansible friction-ring between said heads, a shell surrounding said ring and free to turn in one direction, and means for holding said shell against turning in the opposite direction, substantially as described.

HOPPER OR BIN.—No. 836,679; Ulysses A. Garred, Anaconda, Montana.

In a dumping apparatus, a series of hoppers for receiving the material to be dumped, a discharging-door for each hopper, means for retaining said doors in a closed position, a rock-shaft disposed in proximity to the hoppers, and suitable independently controllable pivoted levers extending across the shaft for actuating the retaining means and releasing the doors, upon, or independently of any movement of the rock-shaft, substantially as set forth.

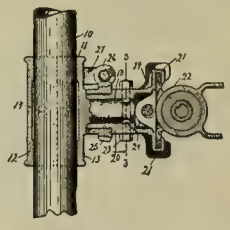


ROCK-DRILL—No. 837,118; Joseph J. Rekar, San Francisco, California.



The combination in a drill, of a channel guide-plate and support therefor, a frame slidable in the guides of said plate, a drill-shank, means for reciprocating said shank within the guided frame, a rack carried by the supporting-plate, a pawl carried by the movable frame and means carried by the reciprocating drill-shank whereby the pawl is caused to engage the rack and advance the drill and frame, said means including a collar upon the drill-shank and a fulcrumed pawl-carrying lever with which the collar contacts.

ROCK-DRILL.—No. 836,846; William C. Whitcomb, Chicago, Illinois.



In a rock-drill, in combination, a supporting column, a sleeve mounted on the column, a trunnion carried by the sleeve, a drill-cradle having a hub fitting over the trunnion, a worm-gear formed on the hub, and a worm-shaft journaled on the sleeve and meshing with the worm-gear.

DRILLING MACHINE.—No. 833,189; Richard Wheater, Novinger, Missouri.

In a drilling machine, the combination with a rotary threaded drill-bar, of a worm-wheel constituting a seat therefor, a supporting-shaft for the worm-wheel, a bracket upon the shaft, driving mechanism including meshed gears upon the bracket and the drill-bar, a friction element having a threaded connection with the shaft for adjustment toward and away from the worm-wheel, and provided in one face with an annular series of sockets, and a locking-pin carried by the bracket and capable of engagement with any of the sockets to adjustably lock the friction element.

New Uses for Asbestos.

The present wide development of the asbestos manufacturing industry has produced various products, the basis of which is asbestos, and adapting them for use in building construction. Asbestos is a natural heat insulator. Its silky fibres are capable of manipulation into any form. They are not affected by the extreme weather conditions, and are absoluely fire-proof and of moderate cost. Commencing at the very foundation of modern buildings, asbestos and its by-products enter largely into their construction, and it is used throughout, exterior and interior, even to roof coverings. The H. W. Johns-Manville Co. has developed various lines of building materials, the basis of which is asbestos. After the first-floor joists of a modern residence are put in place, asbestic plaster can be used in conjunction with either wood or metal lathing as a 'scratch' coat on the ceiling of the cellar. Thus used, it offers a positive fire barrier between floors, and presents the most satisfactory form of plastering known.

Between all floors, and between the outside boarding and clapboards, the use of asbestos sheathing papers and sheathing quilts has met with universal success. These have many advantages over other products, owing to their natural fire resisting properties. They not only prevent the transmission of sound waves between rooms, but will effect a saving in fuel of large proportions, when placed upon the side walls of wooden structures. Similar felts are also used on roofs, under shingles and slates, and insure a comfortable building throughout the entire year.

The Giroux Hot-Blast Top.

The National Metallurgical Co., of Matehuala, is almost ready to put into service the new blast-furnace designed by the Traylor Engineering Co. This furnace measures 42 by 160 in. at the tuyeres, and will treat 250 to 300 tons per day. The furnace is fitted with the Giroux hot-blast top, which consists mechanically of two series of metal pipes arranged symmetrically around the inside of the top of the furnace, the lower ends of the pipes being just above the top of the charging floor. The vertical portion of the pipes is built of sheet steel. These are circular at the bottom where they join the return elbows, and oval and of larger section at the top. The material of the pipes makes them readily permeable to the heat, and their form gives them a large surface for absorbing the heat from the furnace gases. Their form also prevents dust from adhering to them and reducing their capacity for absorbing heat. Near their tops the pipes are connected together in pairs sidewise by means of flanged cast-iron connections, and at the bottoms each pair of pipes is connected to form a continuous series on each side of the furnace by means of cast-iron return elbows. These elbows have a V-shaped section, with one side of the V lying parallel with the side of the furnace top, and the other forming a slope for the hot-furnace gases to impinge against. The cast-iron is used for the elbows because it is the best material to resist the destructive action of the impinging furnace gases. The form of the elbows insures the delivery of the hot gases and its distribution along the sides of the upright pipes in the best manner to insure their giving up of their heat to the blast air passing through the pipes. The attachment is built so that it may be used on furnaces with either sheet metal or brick tops, but the use of the brick top is always recommended. The brick is best because it is a good non-conductor of heat, and thus concentrates the heat of the furnace in the air-pipes.

The blast from the blower enters the furnace at the top of the attachment at the two ends. It then circulates through the air-heating pipes in series after traversing their length passes down through the hot-air connection into the bustle pipe of the furnace, and from thence through the blow-pipes to the tuyeres. This top is mechanically perfect. There is no distortion produced by the heat, as all of the heating pipes are entirely surrounded by the furnace gases, and the expansion is therefore uniform throughout their length. This prevents the distortion from heat which has made other arrangements intended for this purpose failures.

This system has been in use for three years at the United Verde smelter and has proved a great source of fuel economy, besides showing that the design is entirely successful in resisting the destructive effects of contraction and expansion which have made other designs too expensive to maintain. This top, which is also in use at the Giroux Consolidated Mines Co., at Ely, costs practically nothing for repairs. Experience has shown that this system, producing a blast of 400° F., effects a saving of 30% of the fuel charge with some ores, while at the same time increasing the capacity of the furnace 15 to 25%. It allows the use of charges containing 2 to 4% more silica, and the more uniform temperature seems to prevent to some extent the crusting and building up of the walls of the furnace, so noticeable in ordinary practice. The Giroux hot-blast top is applied with advantage and economy to copper-smelting furnaces, where the process is largely oxidizing, and as a result the zone of heat is carried to a comparatively high one in the furnace. The heat thus produced is utilized in heating the blast instead of being wasted.

Publications Received.

NICKEL STEEL. By Albert Ladd Colby. A reprint from the Proceedings of the American Society for Testing Materials. Distributed by the Orford Copper Co., New York.

UNITED STATES GEOLOGICAL SURVEY.—1. 'Ore Deposits of the Silver Peak Quadrangle, Nevada,' by J. E. Spurr. A valuable monograph of 175 pages. 2. 'Geology of the Bighorn Mountains,' by N. H. Darton. A similar report, of 130 pages. 3. 'Geology and Mineral Resources of Mississippi, by A. F. Crider. A bulletin of 95 pages. 4. 'Report on Progress of Investigations of Mineral Resources of Alaska in 1905,' by A. H. Brooks and others; 165 pages. Contains several valuable descriptive articles. 5. 'Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy,' for the years 1901-1905, inclusive, by F. B. Weeks; 740 pages. An extremely useful book of reference. 6. 'Contributions to Economic Geology,' 1905, edited by S. F. Emmons and E. C. Eckel. A bulletin of 500 pages. Not as rich in material as preceding volumes of this series but it contains much valuable information.

Trade Treatises.

T. H. PROSKE, of Denver, issues an illustrated catalogue of the Ajax Drill Sharpener. The pamphlet includes numerous testimonials as to the efficiency of the machine.

THE UNITED IRON WORKS CO., of Springfield, Mo., issues a neat catalogue describing the concentrating machinery that it manufactures. Several drawings of mills are included.

THE AMERICAN DIAMOND ROCK DRILL CO. has issued catalogue No. 26, entitled 'The Diamond Drill and Its Work.' The catalogue contains 88 pages, and besides thoroughly describing the diamond-core drills manufactured by the company, gives many records of performances that should be read with interest by engineers and contractors. There is also a brief description of the kinds of diamonds used and the process of mining and preparing them. The pamphlet closes with complete tables of prices, shipping weights, and duplicate parts.

Commercial Paragraphs.

ALLIS-CHALMERS CO., of Milwaukee, issues Bulletin No. 1,510, describing their direct-connected Reynolds Corliss Engines. The bulletin is well illustrated.

THE COLORADO IRON WORKS CO., of Denver, issues Bulletin No. 22, which is devoted to Crushing Rolls, a form of mining machinery for which this company has won a high reputation.

THE SAMSON MANUFACTURING CO., of Denver, Colo., recently received orders for one No. 3 Samson Crusher for shipment to the Wind River M. Co. at Shoshone, Wyoming (this was sold by the Merralls Mill Co.), two No. 4 Crushers to Fairbanks, Morse & Co., one for shipment to Salt Lake City, and the other for the Denver branch, and one No. 4 to the Colorado Iron Works Company.

